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PSYCHOTRIA L. (RUBIACEAE) IN THE HAWAIIAN ISLANDS[1]

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The genus *Psychotria* has more often than not proven a taxonomist's nightmare, and the Hawaiian representatives are certainly no exception to this general rule. The genus in the Hawaiian Islands demonstrates some of the basic phenomena imposed on members of oceanic biotas in general. These phenomena were pointed out by Wallace (1881) and most recently by Carlquist (1965, 1966a, 1966b, 1966c, 1966d, 1967, 1970). One may see the resulting taxonomic confusion in normally less complicated groups than *Psychotria: Gouldia* (Fosberg, 1937), *Scaevola* (Gillett, 1966), *Nototrichium* (Sherff, 1951), *Charpentiera* (Sohmer, 1972), etc. Indeed, it is in my opinion surprising that the Hawaiian *Psychotria* are not more complex. Unlike the situation in the Hawaiian members of the genus *Cyrtandra,* where St. John (1966) has been able to recognize numerous, apparently discrete, taxa, the situation in *Psychotria* has led to the recognition of relatively fewer taxa which are usually very difficult to characterize. Differences in the breeding systems of these organisms, of course, have a great deal to do with the nature of their biological diversification and the potential trends and options available to them in new situations. Most taxa of *Psychotria* in the Hawaiian Islands tend to demonstrate a great deal of ecological amplitude, with the morphological boundaries between them often obscure. This kind of situation is predictable where it is advantageous to maximize the gene pool within which recombination may take place, as apparently is often the case under insular conditions (Carlquist, 1966d; Rattenbury, 1962).

TAXONOMIC HISTORY OF PSYCHOTRIA IN THE HAWAIIAN ISLANDS

The taxonomic history of the genus in the Hawaiian Islands began with the publication by Chamisso and Schlechtendal (1829) of an account of the Rubiaceae collected during the Romanzoffian expedition around the world.

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The expedition touched at Oahu ("O. Wahu") and there, probably in the southern Koolau Mountains behind Honolulu, or what has become Honolulu, material of two taxa within the genus was acquired, which the authors placed in the genus *Coffea*.

The next account was by Asa Gray (1858), who described a new genus, *Straussia*, to which he transferred the taxa described by Chamisso and Schlechtendal, and also described a third species in his new genus. There followed in 1867 a publication by Horace Mann in which he reported the results of a collecting expedition he made to the Hawaiian Islands in the company of Mr. Brigham. Mann and Brigham specimens figure importantly in nearly all taxonomic work with the Hawaiian flora. Mann described two new species which he placed in the genus *Psychotria* sensu str., found on the island of Kauai. *Straussia* and *Psychotria* were to be treated as separate genera in the Hawaiian Islands until relatively recently. In 1874 Dr. Heinrich Wawra published the results of his collecting expedition to the Hawaiian Islands.

Dr. William Hillebrand's treatment of *Straussia* and *Psychotria* was as thorough as his treatment of the other taxa in his *Flora of the Hawaiian Islands* (1888). He described two new species in *Straussia* as well as a number of infraspecific taxa. Another mainland botanist who came to Hawaii to collect, A.A. Heller, published his results in 1897. Heller made good and copious collections, usually in several to many duplicate sets. He also described a couple of new species.

H. Léveillé described a new species of *Straussia* in 1911. In 1913 Joseph F. Rock published his classic and well-illustrated work, *The Indigenous Trees of the Hawaiian Islands*. Rock therein described a number of new taxa in his treatment of *Straussia*.

One of the most outstanding observers for his day of the Hawaiian flora, particularly for recognizing such things as dioecism and floral heteromorphy, was Carl Skottsberg. In several papers (1935, 1944a, 1944b) he published results of his own collecting expeditions to Hawaii as well as treating in some detail the phenomenon of floral dimorphism in the Rubiaceae of Hawaii, including *Straussia* and *Psychotria*.

The important recent work with the genus *Psychotria* in the Hawaiian Islands has been that of Fosberg (1962, 1964). In 1962 Fosberg transferred some names in *Straussia* to *Psychotria*. The 1964 paper was an attempt to summarize all the taxa then known for the latter genus in Hawaii. Fosberg therein formally reduced the genus *Straussia* to a section of *Psychotria* and described a new section *(Pelagomapouria)*. He also reported the presence in Hawaii of *Psychotria* section *Psychotria*, based on a Mann and Brigham collection. His treatment of section *Pelagomapouria* was complete, with a key, citation of specimens examined, and descriptions of several new taxa, including two subspecies of *Psychotria hexandra*. The treatment of section

Straussia, however, was incomplete due to that taxon's complexity; it was presented mainly to enable future work to proceed.

Besides these papers mentioned, there have been a few others which have dealt with the description of single taxa, such as those of Degener and Hosaka (1940) and St. John (1975). St. John (1973) also provided a list of all names published in *Psychotria* and in all other flowering plant genera known from the Hawaiian Islands.

I consulted herbarium specimens for study from the institutions listed below, for which privilege I thank their administrators: Arnold Arboretum of Harvard University (A), Bernice P. Bishop Museum (BISH), British Museum (Natural History) (BM), Field Museum of Natural History (F), Gray Herbarium of Harvard University (GH), Pacific Tropical Botanical Garden (PTBG), Rancho Santa Ana Botanic Garden (RSA), Royal Botanic Gardens, Kew (K), Missouri Botanical Garden (MO), New York Botanical Garden (NY), Muséum National d'Histoire Naturelle, Paris (P), Naturhistorisches Museum, Wien (W), U.S. National Herbarium (US), University of Hawaii-Manoa (HAW), University of Minnesota (MIN), University of Wisconsin (WIS). Specimens on deposit at the University of Wisconsin – La Crosse Herbarium (UWL) were also utilized.

This contribution to botany deals strictly with the genus *Psychotria* as it exists in the Hawaiian Archipelago. All references to measurements or habit relate only to the Hawaiian representatives of this genus.

PSYCHOTRIA L. Syst. Nat. ed. 10: 929, 1364. 1759. Nom. cons.

Shrubs or trees with caducous stipules, these usually firm and appressed but not forming a calyptra, and with membranaceous to stiffly coriaceous, glabrous to pubescent blades; inflorescence usually with one primary or main axis with one or more orders of verticillate branching, the ultimate branches usually terminating in cymules of three flowers, or the inflorescence trichotomous from the base with one or two orders of trichotomous branching, the branches divergent, spreading, rarely the inflorescence capitate or globose; flowers often structurally bisexual but apparently always functionally unisexual, usually dimorphic as well, 4-, 5-, or 6-merous; calyx glabrous or pubescent, with the tube usually shorter than the hypanthium, often dilated toward the apex and either truncate at the top or with short acute or obtuse lobes; corolla white, usually glabrous, with the tube somewhat expanded toward the apex, 1 – 24 mm. long, glabrous or pubescent at the throat, and with the lobes shorter or longer and reflexed at anthesis; stamens with filaments affixed basally or dorsally ¼ to ⅓ the way from the base of the linear-oblong or oblong-ovate anthers, exerted at anthesis in the functionally staminate flowers; pistil with bilocular ovary with terminal disc and with style 1 – 28 mm. long at anthesis, with 2 stigmas 0.2 – 6 mm. long and divergent in the functionally pistillate flowers, appressed in the functionally staminate flowers; ovules solitary, affixed to the base of the locules, erect, anatropous; fruit globose or pyriform, fusiform or elongate-cylindrical, with the pyrenes either triangular or semicircular in cross section, sometimes

with secondary ridges developed, the wall of the pyrene usually thick and hard, representing the endocarp of the fruit; seed usually conforming to the form of the pyrene, with a thin seed coat which in some Hawaiian taxa is invaginated on the ventral or inner face of the seed into a "T"-shape in cross section, with endosperm otherwise not ruminate, carnose, and with the embryo small with flat, thin cotyledons.

I have no evidence to indicate that the sections *Pelagomapouria* and *Straussia* established by Fosberg (1964) within the genus *Psychotria* deserve different treatment, although I have seen no evidence at all that section *Psychotria* is present in Hawaii. Evaluation of the sections can come only at the conclusion of work with the genus on a worldwide basis. Until such an evaluation is possible, it is probably best to accept previous treatments of the genus and to avoid making new formal groupings of species based on samples from restricted areas. In Hawaii, however, the sections *Straussia* and *Pelagomapouria* work well and that treatment will be utilized here to group the species, even though the exact relationships between these taxa and the rest of the genus is unknown at present.

Characters of Taxonomic Significance

It is always useful to provide a distillation of the characters that are important in differentiating between the taxa in a group with which one has been engaged. It provides a quicker, if not better, insight into the group of organisms involved. In the case of Hawaiian *Psychotriae*, there are such sharp distinctions between the two sections recognized that it will often be necessary to refer separately to those characters found in one and those found in the other.

Habit. Most of the Hawaiian *Psychotriae* are small trees or shrubs. The habit can be variable, and one or two of the taxa may range from shrubs to moderately sized trees. *Psychotria mariniana* can develop some very large specimens, and I have personally seen a few individuals of this species in the Waianae Mountains of Oahu that were over 20 m. tall and had robust trunks.

Indument. A certain number of the taxa are pubescent in one or more plant parts. Most of the hairs encountered are multicellular, or at least have a basal cell that is differentiated from a longer, terminal cell (Figure 79c). I have found that the same taxon, but not necessarily the same individual, will produce both multicellular hairs and unicellular hairs, the latter of which seem to be the result of weak cell wall differentiation within the trichome, rather than no cell wall differentiation at all. The hairs that are present at the throat of a corolla tube are much longer and stouter than those on the surfaces of leaves, inflorescence axes, or calyces and corollas. These hairs are also often unicellular, but that is not always the case. The hairs within stipules and bracts are also quite long, but they are always multicellular and are associated with colleters. The presence or absence of pubescence on plant

parts, particularly the leaves, is a character that has been utilized frequently in Hawaiian *Psychotriae* to distinguish between infraspecific taxa. One of the varieties of *P. hawaiiensis*, for example, is distinguished primarily by the fact that its leaf blades are pubescent beneath. This character must be used with caution. The color of the pubescence is also important: whitish or yellowish brown as opposed to reddish.

Stipules and leaves. Stipular shape and size in Hawaiian *Psychotriae* is not a character that can be utilized to differentiate taxa. Stipules are generally broadly ovate or obovate and are of variable sizes. The stipules of both sections are appressed and never calyptrate. Leaf size, shape, and texture vary considerably, and in some cases these characters, in combination with others, are helpful in distinguishing taxa. *Psychotria wawrae*, for example, has the largest leaves in the section *Straussia* with short, very stout petioles.

Inflorescences. The inflorescences possess either one main axis or are trichotomous with three, apparently separate, axes arising from the branchlet apex. The inflorescences are terminal, although they may be overtopped by continued growth of the stem. Branching of the inflorescence is dichotomous, trichotomous, or verticillate. The ultimate branches terminate in either a single sessile flower or in a cymule of 3 flowers. The branching pattern is important, for in section *Pelagomapouria* it is dichotomous, trichotomous, or verticillate, but in section *Straussia* it is always verticillate. There are inflorescence bracts produced in nearly all taxa, but their presence is a variable character and they are usually early caducous.

Perianth. The flowers are 4-, 5-, or 6-merous. In some taxa one may find all types on one inflorescence. The calyx is lobed or nearly truncate at the top. The tube is usually no larger than the lobes. There are no features of the calyx that have proven significant from a taxonomic point of view, other than that sometimes the size and nature of the indument, if present, may aid in differentiating a particular taxon. The corollas are white in color, with lobes reflexed at anthesis. The length of the corolla tube is one of the major differences between the two sections present in Hawaii. The members of section *Pelagomapouria* have corollas whose tubes are never less than 6 mm. long, whereas those in section *Straussia* are never over 6 mm. long. Within section *Pelagomapouria* differences in tube length, lobe length relative to tube length, and the shape of the corolla in bud are all significant characters. In section *Straussia* the corolla morphology is much less useful as a taxonomic character; indeed one of the features of the corolla most utilized in the past for one complex of species, the presence or absence of pubescence at the throat of the tube, is of little value, being extremely variable.

Androecium. In section *Pelagomapouria* the anther size and shape differs between *Psychotria hexandra* on the one hand and *P. grandiflora* and *P.*

hobdyi on the other. In section *Straussia* there are no useful taxonomic characters associated with the morphology of the anthers. In pistillate flowers, of course, the stamens are usually reduced to staminodes. Androecial morphology, however is one of the most telling differences between the sections. Notwithstanding a significant difference in the size of these floral parts between the sections, anthers in *Pelagomapouria* are dorsifixed, whereas in *Straussia* they are basifixed.

Gynoecium. The ovary, in most taxa, is usually obpyriform or obovate, with a terminal disc that completely surrounds the base of the filiform style. There is one ovule in each of the two locules of the ovary. Differences in style and stigma length are significant in section *Pelagomapouria*. In section *Straussia*, however, there exists some variation in size but nothing that can be utilized from a taxonomic point of view. In staminate flowers of all species, the pistil usually is small, with short styles and unexpanded stigmas. In all pistillate flowers the stigmas are raised above the rim of the corolla tube and are either pubescent or papillose, rarely glabrous.

Fruits and seeds. The fruit is either globose, obpyriform, or, in one case, cylindrical, ribbed or unribbed. Fruits produced by members of section *Pelagomapouria* are larger than those produced by members of section *Straussia*. The calyx usually is persistent in the fruit and as such, in section *Straussia*, has some taxonomic value. The remnant calyx will either be as broad as the apex of the fruit or it will be narrow. The disc that was at the apex of the ovary sometimes expands in the fruit and protrudes from within the remnant calyx. In *Psychotria hawaiiensis* the fruit is usually much smaller than those produced by the other members of section *Straussia*.

Each fruit at maturity contains two pyrenes which in cross section are either semicircular or triangular. Those that are triangular in outline (section *Pelagomapouria*) have seeds that do not have a "T"-shaped invagination on the inner or ventral surface. Those that are semicircular in outline (section *Straussia*) have seeds that do have such an invagination on the inner or ventral surface.

Floral dimorphism. Skottsberg (1944b) was the first really to demonstrate the existence of dimorphism in Hawaiian *Psychotriae,* although Hillebrand (1888) first noticed it. It is present in all species, and invariably the pistillate flowers have smaller corollas than the staminate flowers of the same species. This dimorphism has in the past been the cause of species being described from staminate and pistillate individuals of the same species. Sometimes this difference is striking, as in *Psychotria psychotrioides* (FIGURES 25 and 29) and *P. hathewayi*. Skottsberg did not notice dimorphism in section *Pelagomapouria* (his *Psychotria*), and rather considered the flowers there to be bisexual, protandric, and homostylous. I have had more specimens of these taxa at my disposal than Skottsberg had and I do find evidence of dimorphism in section *Pelagomapouria*, or at least I

have found flowers with sterile stamens. Admittedly, there is not as great a relative difference between staminate and pistillate flowers in this section as there is in section *Straussia*.

PHYLOGENY

The genus in Hawaii, I believe, represents two or possibly three lines of development from as many ancestors which were introduced to the Hawaiian Islands at some point in the past. One of the lines of development or evolution has led to the complex of species that are in *Psychotria* section *Straussia*. Another line of evolution has led to the complex of infraspecific taxa within the species *P. hexandra* Mann, which, along with *P. hobdyi* Sohmer (formerly *P. rosacea* St. John) and *P. grandiflora* Mann, comprise the section *Pelagomapouria*. I believe that the latter two clearly related species may well represent the results of another and separate introduction to the Hawaiian Islands—an introduction separate from, but closely related to, that which resulted in the present day *P. hexandra* Mann. There does not exist at this time experimental evidence to support this conclusion, but the differences in the floral and inflorescence morphology between *P. grandiflora* —*P. hobdyi* on the one hand and *P. hexandra* on the other are great. *Psychotria hexandra* possesses dichotomous or trichotomous branching in the inflorescence, whereas *P. hobdyi* and *P. grandiflora* possess verticillate branching. *Psychotria hexandra* has 6-merous flowers most of the time, whereas the other two species usually have 4- or 5-merous flowers. There are also differences in the length of the corolla tubes and stigmas, as will be specifically indicated in the taxonomic treatment.

The section *Straussia* has been one of the most difficult taxa of Hawaiian plants to comprehend. This has been due to the extraordinary array of forms, intergradations, polymorphisms, and the ecological plasticity of the taxa within the section. The section itself, as an entire unit, is distinct and easy enough to understand. I believe that this is due to a relatively more recent introduction of the progenitor of this section into the Hawaiian Islands, as well as a basic difference in the breeding system, which permits more out-crossing and hybridization, and the wider ecological tolerances of these taxa, than of those in section *Pelagomapouria*. Therefore, beyond the inherent polymorphism, one has also to contend with weak genetic barriers between taxa in this group, which is probably of selective value under insular conditions as mentioned above. The taxonomy of the section reflects this, and one cannot approach it with classical taxonomic concepts, for if one is not willing or able to recognize large, broadly defined taxa, one is rapidly reduced to naming and describing each of the endless series of forms and variations present. The biological integrity of the section, which results in indistinct morphological boundaries, affects such mundane, but important, matters as the construction of keys, for it is impossible to provide a key to the

species in any other format than by removing one species at a time. However, once one recognizes the basic uniformity of the group, views most of the species as radiations from a taxon still in the process of differentiation, and declines the apparent but unrealistic opportunity of naming varieties and forms, trends and developments within the section become a little more understandable.

KEY TO SECTIONS

Corolla tubes more than 6 mm. long; anthers more than 3 mm. long, the filaments dorsifixed ⅓ – ¼ of the way from the base; styles more than 6 mm. long; pyrenes triangular in cross section and without invagination of the seed coat .....section *Pelagomapouria*

Corolla tubes usually less than 3 mm. long; anthers less than 2.5 mm. long, the filaments basifixed; styles less than 6 mm. long; pyrenes usually semicircular in cross section and usually with a "T"-shaped invagination of the seed coat on the ventral or inner surface. section *Straussia*

Psychotria section **Pelagomapouria** Fosberg in Brittonia **6:** 257. 1964.

Shrubs or small trees with obovate, appressed, caducous stipules; leaves petiolate, the blades ovate to obovate, membranceous to coriaceous, plane or with a marginal rib; inflorescence terminal either with one main axis or trichotomous to base, often reflexed or pendent, the 1 – several nodes with dichotomous, trichotomous, or verticillate branching, the ultimate branches terminating in cymules of 3 flowers or a solitary flower; flowers dimorphic or at least functionally dioecious, 4-, 5-, or 6-merous, sessile or on pedicels; calyx tubular or dilated toward the apex, truncate or with lobes; corolla with tube more than 6 mm. long, the lobes shorter than to somewhat longer than the tube and reflexed at anthesis; stamens with filaments dorsifixed ⅓ to ¼ from the base of the oblong-linear anthers, these more than 3 mm. long (in staminate plants); pistil with styles more than 6 mm. long, and with stigmas that may be larger than the style (in pistillate plants); fruit with pyrenes triangular in cross section and usually without invagination of the seed coat on the inner or ventral surface.

TYPIFICATION: The type species designated for this section by Fosberg when he described it is *Psychotria hexandra*. The section is well set off from the members of section *Straussia* by the dorsifixed anthers, the much larger dimensions of the flowers, and the strongly reflexed peduncles.

DISTRIBUTION: Members of the section are found on the islands of Kauai and Oahu, the two oldest of the main islands of the present Hawaiian Archipelago. Individuals are therein found in the higher, wetter forests, or the moist forests near the heads of gulches.

Fosberg indicated his belief that the affinities of this taxon are with *Psychotria* subgenus *Mapouria*. Should the resemblance between section *Pelagomapouria* and subgenus *Mapouria* not be merely coincidental, one would look within the latter taxon to find the antecedents of the former. I have superficially examined members of the subgenus *Mapouria*, but any significant comments dealing with the potential or assumed relationships

between the sections here treated and the extra-Hawaiian representatives of the genus must await further study.

KEY TO SPECIES OF SECTION PELAGOMAPOURIA

Inflorescence with opposite or trichotomous branching; flowers mostly 6-merous, the corolla tubes 6 – 10 mm. long at anthesis with subulate or linear lobes; stigmas 1 – 6 mm. long (Kauai, Oahu) ..... 1. *P. hexandra*

Inflorescence with verticillate branching; flowers usually 5-merous, the corolla tubes 10 – 24 mm. long with ovate or ovate-subulate lobes; stigmas usually less than 2 mm. long.

Inflorescence with peduncle 0.5 – 9.5 (usually over 3) cm. long; leaf blades usually coriaceous and revolute (Kauai) ..... 2. *P. grandiflora*

Inflorescence with peduncle 0.2 – 1 (usually less than 0.5) cm. long; leaf blades membranaceous to chartaceous, plane, or very weakly revolute, often suffused with a reddish or pinkish pigmentation (Kauai) ..... 3. *P. hobydi*

1. **Psychotria hexandra** Mann in Proc. Amer. Acad. Arts **7:** 170. 1866; Wawra in Flora **57:** 328. 1874; Hillebr. Fl. Haw. Isl. 181. 1888; Heller in Minnesota Bot. Stud. **1:** 902. 1897; Rock, Indig. Trees Haw. Isl. 455. *pl. 189.* 1913; Fosberg in Brittonia **16:** 259. 1964.

Trees or shrubs to 6 m. tall, with irregularly obovate stipules to 15 cm. long and 10 cm. wide; leaves with petioles 0.4 – 3 cm. long and obovate to oblanceolate, membranaceous, chartaceous, or coriaceous blades 1.3 × 3.1 – 9 × 20.8 cm. wide and long, the blades acute or tapering into petiole at base, acute at apex and often with a very pronounced, acute tip, with 7 — 12

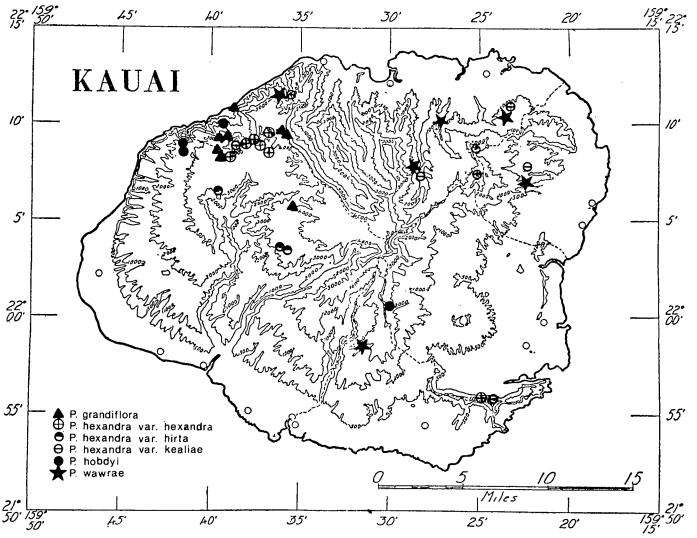


FIGURE 1. Distribution of *Psychotria grandiflora, P. hexandra, P. hodbyi,* and *P. wawrae* on the island of Kauai.

pairs of lateral veins; inflorescence either with one main axis or trichotomous from base, to 12 cm. long, with dichotomous branching, the ultimate branches usually terminated by 3 flowers disposed in cymules, the central and oldest flower of each cymule on a short, stout pedicel, or sessile directly upon the penduncle or branch, the lateral flowers of the cymule usually sessile at the apex of opposite secondary peduncles and subtended by opposite sterile bracts which arise at the apex of the secondary peduncles; flowers usually 6-merous, with a tendency to dioecism; calyces 4 – 5.5 mm. long (including hypanthium), expanded toward the summit, and truncate or lobed; corolla white, obtuse or acute in bud, at anthesis with tube 6 – 10 mm. long, expanded toward the top, pubescent at the throat, and with narrowly ovate-subulate or linear lobes as long as the tube or much longer; stamens on very short filaments at anthesis affixed about ⅓ from the bottom of the 4 – 6 mm. long, narrow, somewhat curved anthers; pistil with ovary about 4 mm. long (including terminal disc) at anthesis, the style 4 – 6 mm. long, the stigmas bifid and the lobes puberulent on the interior surface, from 1 mm. long to nearly as long as the style; fruit cylindrical to fusiform, 5 × 8 – 8 × 18 mm. wide and long, usually crowned by the 2 – 4.5 mm. long persistent calyx; pyrenes with ventral surface flat and dorsal surface angled, almost triangular in cross section, and without invagination of the seed coat.

Individuals of the species are found on the islands of Kauai and Oahu, in wet forests at elevations of 300 – 1,200 m.

The species is very conspicuous and easily recognizable when in bloom, and one can soon learn to recognize it by the leaf blade shape and nervation which, in subtle ways, distinguish it from all other species of *Psychotria* in the Hawaiian Islands. As Fosberg (1964) has pointed out, it is divisible into a number of infraspecific taxa. There is one subspecies each on Kauai and Oahu, with varieties in each. The differences in the length of the "style branches" (= stigmas) pointed out by Fosberg between the two subspecies is, at least in part, apparently due to the results of the tendency to a dioecious breeding system and a resultant heteromorphy between the sexes.

KEY TO INFRASPECIFIC TAXA OF PSYCHOTIRA HEXANDRA
[ADAPTED FROM FOSBERG (1964)]

Corolla apex obtuse in bud; stigmas of functionally pistillate individuals often flattened, 1 – 4 mm. long (Kauai) ..... 1a. subsp. *hexandra*
Leaf blades coriaceous or chartaceous, usually cuneate or acute at base.
Blades glabrous or slightly hirtellous below; corolla tube 6 – 9 mm. long. 1a1. var. *hexandra*
Blades strongly hirtellous below; corolla tube mostly 10 – 13 mm. long. 1a2. var. *hirta*
Leaf blades usually chartaceous and attenuate at base ..... 1a3. var. *kealiae*
Corolla apex acute in bud; stigmas of functionally pistillate individuals terete, often with ventral surface flattened, puberulent, 3 – 6 mm. long (Oahu) ..... 1b. subsp. *oahuensis*
Inflorescence with one main axis, 2 – 3 times branched; pyrenes usually with one keel only.
Fruit ellipsoid-globose, 8 – 15 mm. long (not including the persistent calyx tube); corolla lobes about equal to tube ..... 1b1. var. *oahuensis*.
Fruit narrowly and asymmetrically ovoid, 15 – 22 mm. long (not including the persistent calyx tube); corolla lobes usually longer than the tube..... 1b2. var. *hosakana*
Inflorescence trichotomous from base, once or not at all branched; pyrenes often with secondary ridges on dorsal surface ..... 1b3. var. *rockii*

1a. **Psychotria hexandra** subsp. **hexandra**; Fosberg in Brittonia **16:** 259. 1964.

Corolla in bud obtuse or rounded at apex; stigmas of functionally pistillate flowers 1 – 4 mm. long and often flattened.

1a1. **Psychotria hexandra** var. **hexandra**; Fosberg in Brittonia **16:** 259. 1964. FIGURES 1 – 5

Psychotria hexandra; var. *hexandra* f. *hexandra;* Fosberg in Brittonia **16:** 259. 1964.
Psychotria hexandra var. *hexandra* f. *waialuana* Fosberg in Brittonia **16:** 259. 1964.

Small tree to 4 m., with broadly ovate to obovate stipules rounded at apex and to 10 mm. long; leaves with petiole 0.1 – 1 cm. long, and with obovate, coriaceous to chartaceous blades 3 – 9 cm. long, these obtuse or acute at base, acute at apex; inflorescence with one main axis with peduncles 0.5 – 2.5 cm. long, infrequently trichotomously branched from the base, and with branches reflexed; calyx campanulate or funnel-form, 2 – 5 mm. long at anthesis, with small acute or obtuse lobes or truncate; corolla with tube 6 – 8 mm. long, the lobes 5 – 7 mm. long, reflexed at anthesis; stamens with filaments less than 2 mm. long at anthesis, with oblong-linear anthers 3 – 4 mm. long (smaller and often sterile in flowers of individuals that tend to be functionally pistillate), affixed to filaments about ¼ – 1⅓ from the base; pistil with ovary 1.5 – 2 mm. long at anthesis, the style 9 – 11 mm. long, the stigmas flattened, divergent, 2 – 4 mm. long and pubescent on the inner surfaces; fruit ellipsoid or fusiform, 9 – 15 mm. long at maturity with the persistent calyx tube 2 – 3.5 mm. long; pyrenes nearly triangular in cross section and without invagination of the seed coats.

TYPIFICATION: Mann (1867) cited two collections when he described his new species. Fosberg (1964), however, designated one of these, *Mann & Brigham 570*, as the "holotype" for his f. *hexandra*, and thereby also indicated it as lectotype for the species proper. It is, of course, the lectotype for the subspecies and variety as well. The collection was made in the "mountains above Waimea." There are two sheets at BISH, one of which I have designated as the lectotype, the other as an isolectotype. There is also an isolectotype at US.

Fosberg's forms are not here maintained, for there is considerable variation in leaf texture and his treatment attempts to separate individuals with chartaceous leaves from those with coriaceous leaves. This fails because there are too many intergradations. The holotype for f. *waialuana* is *Lydgate s.n.* (BISH), which was collected on the Power Line Trail in the Waialua Mountains of Kauai.

DISTRIBUTION: This variety is found in the higher (to more than 1,300 m.), wetter forests of Kauai and is the most common of the varieties of this species on that island (FIGURE 1).

KAUAI: Kokee area: NE of Kalalau Lookout, *Degener & Hatheway 20519* (NY, US), *Herbst 999* (BISH, HAW), *Stern 2993* (PTBG, RSA); trail N from Kokee, *Alexander & Kellog, 5240 (BISH);* Nualolo Trail, *Fay 351* (PTBG); Awaawapuhi Trail, *Pearsall 428* (BISH); near main road, *Pearsall*

FIGURE 2. *Psychotria hexandra* var. *hexandra* Mann from *Mann & Brigham 750* (BISH, LECTOTYPE).

443 (BISH); Kanalo Huluhulu Ranger Station, *Fosberg 12639* (BISH, F, MO, US); road from Kokee to Camp 10, *Carlquist 537* (RSA); Kahuamaa Flat, *Herbst 2048* (BISH, PTBG); Halemanu, *MacDaniels 778* (BISH), *Rock*, in Feb. 1956 (BISH); between Kokee and Kilohana, *Skottsberg 954* (BISH); Kaunuohue Ridge between Kilohana Lookout at Puu O Kila and Pihea, *Stern & Carlquist 1238* (RSA, US); Kokee – Alakai Road, *Baxter*, in Feb. 1939 (MO); Waimea, *St. John et. al.*, 26 Dec. 1930 (BISH); trail to Alakai Swamp, *Rock*, in Feb. 1956 (BISH); Kokee area without specific locality, *Rock*, in Feb. 1956 (BISH); "mountains above Waimea", *Mann & Brigham 570* (BISH, LECTOTYPE; BISH, US, ISOLECTOTYPES); Alakai Swamp, *Degener & Greenwell 21651* (BISH, NY); NW end of Alakai Swamp, *St. John et. al. 10787* (BISH); W slope of Mt. Kahili, *Fay 367B* (PTBG, UWL); ridge W of Hanapepe River, *Heller 2680* (A, BISH, F, GH, MIN, MO, NY, P, US); Waialua Mts., Power Line Trail, *Lydgate s.n.* (BISH, HOLOTYPE of f. *Waialuana*); W side of Haupu, *MacDaniels 743* (BISH); Power Line Trail between Hanalei and Lihue, *Forbes 134.K* (BISH).

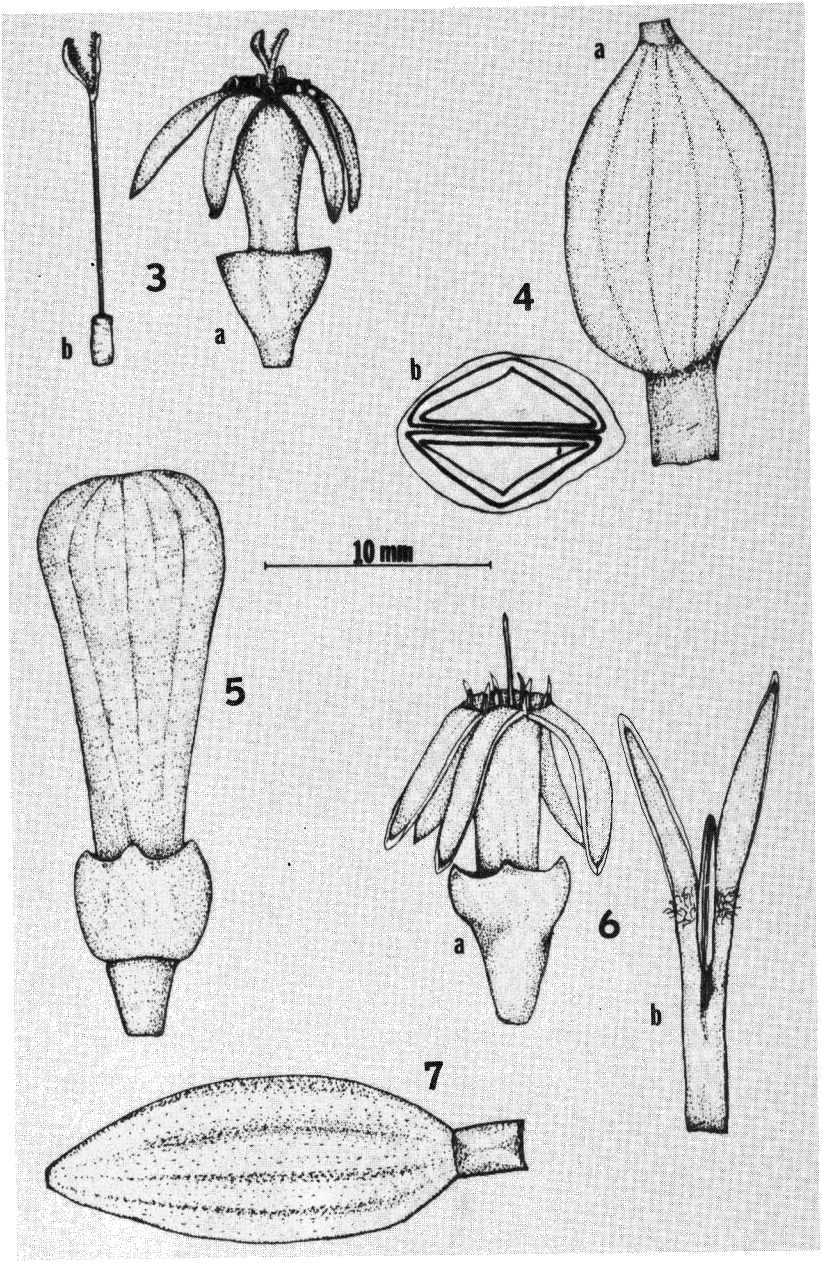
1a2. **Psychotria hexandra** var. **hirta** Wawra in Flora **57:** 329. 1874; Fosberg in Brittonia **16:** 260. 1964. FIGURE 1

Psychotria hirta Heller in Minnesota Bot. Stud. **1:** 903. 1897. *Psychotria hirtula* Skottsberg in Acta Horti Gothob. **15:** 472, nom. nov., 1944.

Shrub or small tree to 3 m., with brownish gray branches and with ovate to obovate stipules to 10 mm. long; leaves with petioles 0.3 – 1.3 cm. long and chartaceous to coriaceous, obovate to oblanceolate blades 2 × 4.5 – 4.5 × 8.5 cm. wide and long, these acute to long-acuminate at base, rounded or obtuse at apex and often with an abrupt short point, usually strongly hirtellous below, and with 5 – 12 pairs of lateral veins; inflorescence with one main axis, the peduncle usually reflexed, 5 – 15 mm. long, usually only once branched, the branches terminating in 3-flowered cymules, with the terminal flower of each cymule sessile, and the laterals on short secondary peduncles; calyces funnel-form, 3 – 4 mm. long, with small, acute to obtuse lobes; corolla tube narrowly cylindrical, very slightly expanding toward the apex, 9 – 13 mm. long, with ovate-subulate or linear lobes 6 – 10 mm. long; stamens of the functionally staminate individuals with filaments less than 2 mm. long, affixed ¼ – ⅓ from the base of the oblong-linear 4 – 6 mm. long anthers; pistil with ovary 2 – 3 mm. long at anthesis, the style 14 – 17 mm. long, the stigmas 1 – 2 mm. long and papillose; fruit fusiform to pyriform, 10 – 14 mm. long, capped by the persistent 2 – 4 mm. long calyx tube; pyrenes triangular in cross section and without invagination of the seed coat.

TYPIFICATION: Wawra described his new variety from material he collected in the forests of Halemanu ("Gebirgswälder von Halemanu"). The type collection is *Wawra 2194*. There are two sheets of this collection at W, and I have designated one the lectotype and the other the isolectotype. The specimens show very clearly the densely hirtellous nature of the lower surfaces of the leaf blades, for which the varietal epithet was given. Skottsberg's name (1944), *Psychotria hirtula*, was given because the name *Psychotria hirta* (Wawra) Heller is a later homonym. At the varietal rank, however, Wawra's original name may stand.

DISTRIBUTION: The variety is found mainly on Kaholuamanu on the Waimea plateau extending northward to the Kokee area (FIGURE 1). Moist forests are apparently its preferred habitat, but it does not get into the very


3
a
b
4
a
b
10 mm
5
6
a
b
7

wet forests wherein are found representatives of the nominate variety. Flowering specimens have been gathered mostly during August through October.

KAUAI: Kokee, upper Milolii trail, *Cranwell, Selling, & Skottsberg 2910* (BISH); Kokee, Kanalo Huluhulu Ranger Station, *Fosberg 12635* (BISH); Halemanu, *Wawra 2194* (W, LECTOTYPE; W, ISOLECTOTYPE); Kaholuamanu, *Forbes 326.K* (A), *392.K* (BISH), *Heller 2876* (F, NY), *Hitchcock 15397, 15398, 15598* (all US), *Rock 1901* (BISH), *5300* (BISH), *5303* (A), *5304, 5308* (both GH), *5314* (A), in Oct. 1911 (BISH, GH).

If not for the differences in size of some floral parts and particularly the strongly hirtellous nature of the lower surfaces of the leaf blades of most of the specimens cited above, they may well have remained with the typical variety. The character of the hirtellous leaves is, of course, not constant. This taxon certainly does not merit the specific rank as bestowed upon it by Heller (1897).

1a3. **Psychotria hexandra** var. **kealiae** Fosberg in Brittonia **16:** 260. 1964. FIGURES 1, 6 – 8.

Shrub or small tree to 6 m. with brown to yellowish brown twigs and broadly and irregularly obovate stipules to 12 mm. long; leaves with petioles 0.3 – 2.5 cm. long and chartaceous, oblanceolate to obovate blades 1.5 × 4.5 – 5 × 13.5 cm. wide and long, these attenuate to acuminate at base, rarely acute, rounded to obtuse at apex with an abrupt and projecting blunt point, and with 7 – 15 pairs of lateral veins; inflorescence with one peduncle 2 – 30 mm. long, 1-, 2-, or infrequently 3-times oppositely branched, with relatively broad branch bracts to 4 mm. long, and with the ultimate branches terminating in 3-flowered cymules; flowers mostly 6-merous and sessile, with salverform calyces 2 – 4 mm. long and truncate at the apex, or with rounded, obtuse, or acute lobes; corolla with tube 8 – 11 mm. long, slightly dilated toward the apex and pubescent at the throat and with subulate-linear lobes 5 – 9 mm. long; stamens with very short filaments affixed ⅓ – ¼ from the bottom of the narrowly oblong 5 – 6 mm. long anthers (in functionally staminate plants); pistil with ovary 2 – 4 mm. long, style 10 – 13 mm. long, and stigmas (in pistillate individuals) divaricate, papillose, and 2 – 3 mm. long; fruit fusiform to ellipsoid, 16 – 19 mm. long, crowned by the persistent 2 – 3 mm. long calyx; pyrenes triangular in cross section.

TYPIFICATION: Fosberg (l.c.) designated *Mann & Brigham 564* as the type of this variety. As he points out, it was one of the original collections

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FIGURES 3 – 7. Morphology of flowers and fruit in *Psychotria hexandra* varieties: 3 – 5, var. *hexandra*: 3, from *Fosberg 12639* (BISH), flower (a) with detail of pistil (b) at anthesis; 4, from *Herbst 999* (BISH), mature fruit (a) with cross section (b); 5, floral bud just prior to anthesis, from *Herbst 2048* (BISH); 6 & 7, var. *kealiae*: 6, from *Forbes 977.K* (BISH), staminate flower at anthesis (a) with portion of corolla showing inner surface of the tube (b); 7, mature fruit, from *Forbes 631.K* (BISH).

FIGURE 8. *Psychotria hexandra* var. *kealiae* Fosberg, from *Mann & Brigham 564* (BISH, HOLOTYPE).

cited by Mann when the latter described *Psychotria hexandra*. The collection was made in Kealia. The holotype is at BISH and there are isotypes at GH, NY, and US.

DISTRIBUTION: Rain forests of low and middle elevations at 200 – 1,000 m. (FIGURE 1). Most specimens examined that were in flower were collected from April and May through February. Specimens with fruit have been collected beginning in August or September.

KAUAI: Hanakapiai Valley, east fork, *Hobdy 224* (US); headwaters of Hanalei, *MacDaniels 826* (BISH); Kawaikoi, *Neal*, 22 Aug. 1930 (BISH); Kilauea, Ka Loko Reservoir *Forbes 54 .K* (BISH); Hii Mts., *Forbes 631.K* (BISH), 669.K (MO); Kealia, *Mann & Brigham 564* (BISH, HOLOTYPE; GH, NY, US, ISOTYPES); Haupu, *MacDaniels 879* (BISH); Wahiawa Mts., *Forbes 186.K* (BISH), 254.K (BISH); Waimea drainage basin, west side, *Forbes 912.K* (BISH), *977.K* (BISH); Kauai, without further data, *Wawra 2064* (W).

This variety is separable from the other two by the attenuate leaf blade bases displayed by most of the individuals. There is a clearly defined differentiation of sex. A staminate individual is illustrated in FIGURE 6. A fruit from a pistillate individual is illustrated in FIGURE 7. I would be most surprised if hybridization and introgression did not occur between the varieties, and I have no hesitation in placing the collections that Fosberg mentioned in his discussion of this variety here, even though they do not match the description in every way.

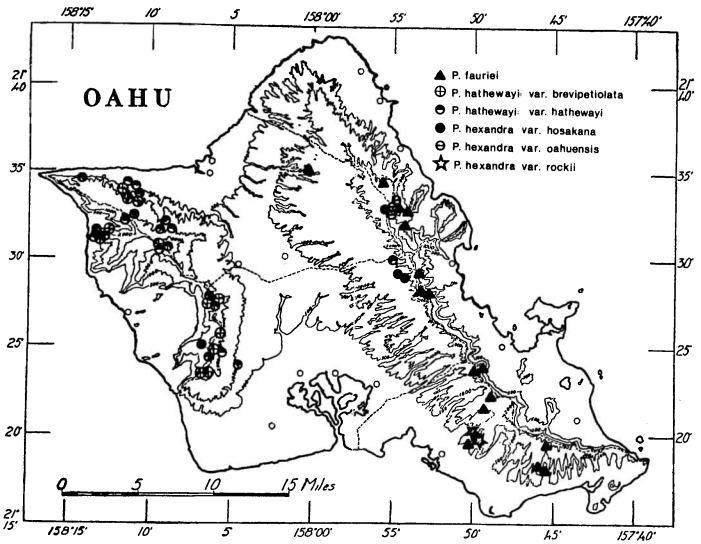


FIGURE 9. Distribution of *Psychotria fauriei*, *P. hathewayi*, and *P. hexandra* on the island of Oahu.

1b. **Psychotria hexandra** subsp. **oahuensis** Degener and Fosberg ex Fosberg in Brittonia **16:** 261. 1964.

Corolla in bud acute at apex; stigmas 3 – 6 mm. long (in pistillate individuals), with the ventral surface flattened and papillose or puberulent.

1b1. **Psychotria hexandra** var. **oahuensis** Degener and Fosberg ex Fosberg in Brittonia **16:** 261. 1964. FIGURES 9, 10, 14.

Tree to 4 m. tall, with young branches fleshy and light to chestnut-brown in color, with broadly obovate, mucronate stipules to 1 cm. long; leaves with petioles 0.4 – 2.5 cm. long and chartaceous, oblanceolate to obovate, usually glabrous blades 2 × 6 – 6.2 × 15.5 cm. wide and long, these acute to narrowly attenuate at base and obtuse to rounded at apex with an acute or acuminate tip, the 5 – 10 pairs of lateral veins usually with domatia with brown hairs in their axils; inflorescence with one main axis with the peduncle 0.9 – 3.6 cm. long, usually thick, 2 – 3 times branched, the central axis with 3 nodes with branches or aborted, the branches subtended by conspicuous, early caducous, deltoid bracts to 6 mm. long, the ultimate branches terminating in cymules of 3 flowers; flowers usually sessile; calyx 6 – 8 mm. long and dilated toward the apex, with acute lobes; corolla with tube 7 – 10 mm. long, slightly dilated toward the apex and densely pubescent at the throat, with linear, ovate, strongly reflexed lobes 6 – 10 mm. long; stamens with very short filaments affixed ¼ – ⅓ from the base of the narrowly oblong 5 – 7 mm. long anthers (staminodes similar, but smaller and narrower); pistil with ovary 3 – 5 mm. long at anthesis (in functionally pistillate individuals), style 6 – 9 mm. long, and stigmas 2 – 4 mm. long; fruit globose-ellipsoid or fusiform, 11 – 13 mm. long and crowned by the persistent 2 – 3 mm. long calyx; pyrenes triangular in cross section or with 2 or more secondary ridges on the dorsal surface.

TYPIFICATION: The type collection was made by F.R. and V.O. Fosberg *(13747)* on the divide between Punaluu and Kaluanui along the Castle Trail in the Koolau Range of Oahu. Fosberg designated the sheet at BISH as the holotype and that at A as an isotype.

DISTRIBUTION: Found principally in the windward Koolau Range in the montane rain forest (FIGURE 9). A population apparently once existed on the leeward side of the Koolaus as well. Flowering specimens have been gathered beginning in November or December, and maturing fruiting specimens have been collected beginning in February.

OAHU: Koolau Mts.: Border of Ewa Forest Reserve, *Christophersen & Wilder 1596* (BISH, P, RSA, US); between Kaipapau and Punaluu, *Forbes & Cook*, 3-8 May 1909 (BISH); between Punaluu and Kaluanui on Castle Trail, *Fosberg & Fosberg 13747* (BISH, HOLOTYPE; A, ISOTYPE); Punaluu, *Forbes & Rock*, 14-21 Nov. 1908 (BISH), *Rock 178* (BISH, MIN, NY, W), *511* (A), *512* (GH), *889* (A).

This variety has not been collected since 1937, judging from the specimens available to me. FIGURE 14 illustrates the morphology of a pistillate flower.

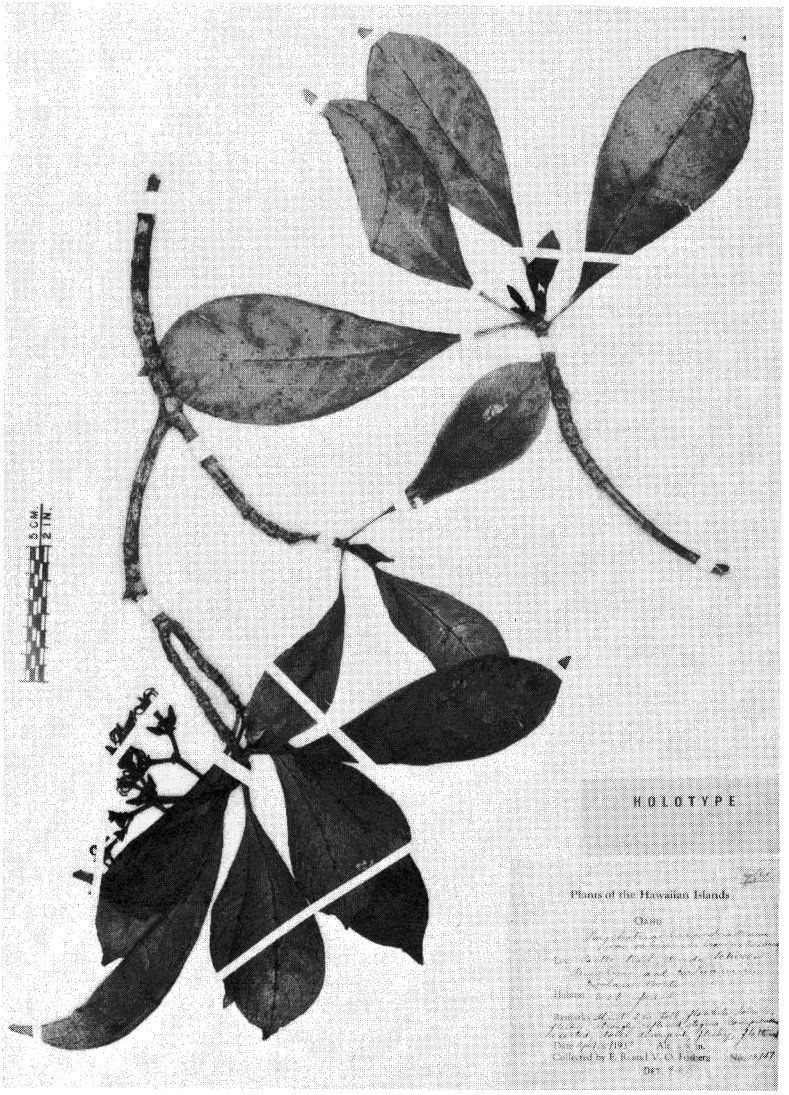


FIGURE 10. *Psychotria hexandra* var. *oahuensis* Degener & Fosberg, from *Fosberg & Fosberg 13747* (BISH, HOLOTYPE).

1b2.**Psychotria hexandra** var. **hosakana** Fosberg in Brittonia **16:** 262. 1964. FIGURES 9, 11 – 13, 15.

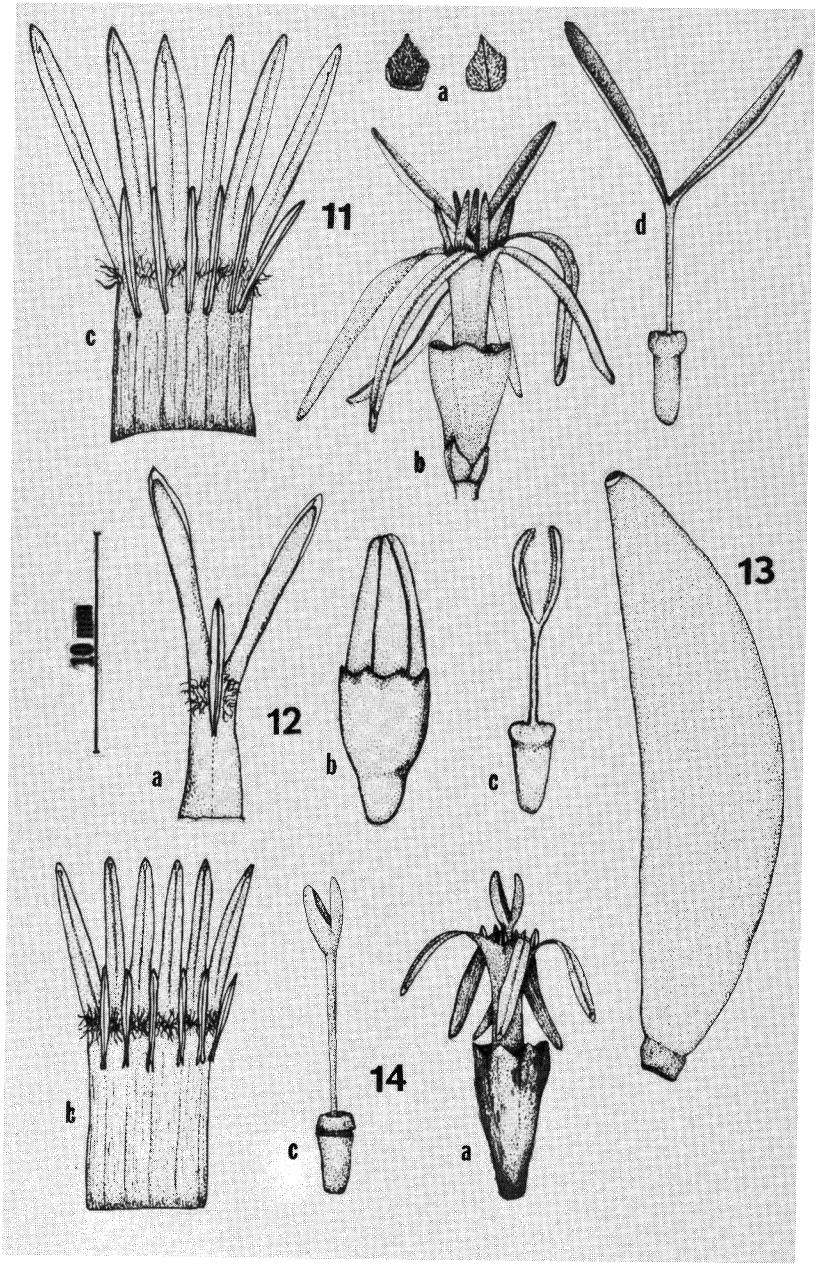
Psychotria hexandra var. *hosakana* f. *hosakana;* Fosberg in loc. cit.
Psychotria hexandra var. *hosakana* f. *forbesii* Fosberg in op. cit. 263. 1964.

Trees to 8 m. tall, with brownish branchlets and broadly obovate stipules to 15 mm. long; leaves with petioles 0.5 – 1.8 cm. long and membranaceous to chartaceous, oblanceolate to obovate blades 2 × 3.4 – 9 × 18.2 cm. wide and long, these acute, acuminate, or attenuate at base, acute or acuminate at apex, glabrous to somewhat pubescent particularly along midrib and veins, with domatia frequently present in the axils of the 6 – 11 pairs of lateral veins; inflorescence with one main axis with 1 or 2 nodes, the peduncle 0.8 – 4 cm. long, once- or twice-branched, the central or main axis often aborted or terminating in a single flower beyond the first branch, the branches subtended by ovate-deltoid bracts to 5 mm. long, the ultimate branches terminated by cymules of 3 flowers; calyx expanded toward the summit, 5 – 7.5 mm. long (including hypanthium), truncate or with acute or obtuse lobes; corolla with tube 6 – 9 mm., slightly expanded toward the summit, pubescent at the throat, and with linear to narrowly lanceolate lobes 8 – 12 mm. long and reflexed at anthesis; stamens with short filaments affixed ⅓ – ¼ from the bottom of the 4 – 7 mm. long, linear-oblong anthers (in staminate individuals); pistil with ovary 3 – 5 mm. long (including terminal disc), style 4 – 7 mm. long, and stigmas 4 – 10 mm. long (in functionally pistillate individuals); fruit narrowly ellipsoid to asymmetrically cylindrical, 15 – 25 mm. long, capped by the persistent 3 – 5 mm. long calyx tube; pyrenes more or less triangular in cross section.

TYPIFICATION: The type collection designated by Fosberg *(Fosberg 9759)* for his variety was obtained from Kipapa Gulch on Oahu. The holotype is at US and there are isotypes at A, F, and P. I have synonymized the forms named by Fosberg with the variety, coming to the conclusion that these taxa, which are based on whether the leaf blades are glabrous or hirtellous beneath, merely represent two of the intrinsic phenetic variations one would expect to find in such a taxon. The type for f. *forbesii* is *Forbes 1702.0,* with the holotype at US and an isotype at BISH. It has leaf blades which are somewhat hirtellous below.

DISTRIBUTION: Mostly found on the moist leeward slopes and in the gulches of the central Koolau Range (FIGURE 9). The members of the variety flower irregularly from November through May. Fruit begin to appear in April.

FIGURES 11 – 14. Variation in flower and fruit morphology in *Psychotria hexandra*: 11 – 13, *P. hexandra* var. *hosakana*: 11, from *Forbes & Thompson s.n.* (A), floral bracts (a), pistillate flower (b) with corolla removed (c) and pistil shown (d); 12, from *Forbes & Thompson s.n.* (BISH), pistillate flower showing portion of corolla (a), unopened floral bud (b), and pistil (c); 13, mature fruit, from *Fosberg 9759* (F); 14, *P. hexandra* var. *oahuensis*, from *Rock 889* (A), pistillate flower (a) with corolla laid open (b) and detail of the pistil (c).


11
a
b
c
d
12
a
b
c
10
13
14
a
b
c

OAHU: Koolau Mts.: Between Punaluu and Kaipapau, *Forbes,* 14 – 21 Nov. 1908 (F, MO), *Forbes & Thompson* (BISH, MO); Kipapa Gulch, *Fosberg, Hosaka, & Morley 9567* (A, BISH, US), *Fosberg 9759* (BISH, HOLOTYPE; A, F, P, ISOTYPES), *Hosaka 1167* (BISH, P, US); Wahiawa Gulches, *Forbes 1702.0* (US, HOLOTYPE of f. *forbesii;* BISH, ISOTYPE); Waialiole Valley, *Rock s.n.* (BISH).

The fruit of this taxon is very distinct. None of the other varieties has the same cylindrical or narrowly elliptic shape (FIGURE 13). Most of the specimens cited above, if flowers are present, have the corolla lobes equal or subequal to the tube. This character, however, is not constant. Non-fruiting collections are therefore cited with a degree of uncertainty. One collection from the windward Koolaus between Kaipapau and Punaluu *(Forbes),* for example, varies within itself. The specimen at MO has lobes subequal to the tube and the duplicate specimen at F has lobes longer than the tube.

1b3. **Psychotria hexandra** var. **rockii** Fosberg in Brittonia **16:** 262. 1964. FIGURES 9, 16.

Psychotria hexandra var. *st.-johnii* Fosberg in loc. cit.

Small trees or shrubs to 4 m., with yellow-brown to chestnut-brown twigs and broadly ovate stipules to 15 mm. long; leaves with petioles 0.3 – 2 cm. long and oblanceolate to narrowly obovate, membranaceous to chartaceous, usually glabrous blades 2.5 × 5.5 – 6.5 × 13.5 cm. wide and long, these attenuate to acute at base, obtuse to rounded at apex, usually with a short, stout point, infrequently with domatia filled with brown hairs in the axils of the 7 – 12 pairs of lateral veins; inflorescence trichotomous from base, the peduncles 0.2 – 2.5 cm. long, each terminating in a single flower or in a cymule of 3 flowers, in the latter case with the central flower sessile directly on the peduncle and the lateral ones sessile at the top of short secondary peduncles; calyx slightly expanded toward the apex and with acute lobes; corolla slightly expanded toward the apex, with tube 8 – 11 mm. long, pubescent at the throat, and with linear-lanceolate lobes 7 – 9 mm. long; stamens with short filaments affixed to the bottom ¼ – ⅓ of the linear-oblong, 5 – 6 mm. long anthers; pistil with ovary 2 – 3 mm. long (including disc) at anthesis, style about 8 mm. long, and stigmas 3 – 4 mm. long (?) (apparently unexpanded in flowers of functionally staminate individuals); fruit broadly ellipsoid or fusiform or oblong-globose, 10 – 14 mm. long, the persistent remnant of the calyx tube and lobes 2 – 4 mm. long; pyrenes mostly triangular in cross section without clear development of secondary ridges; seed without invaginations on the ventral surface.

TYPIFICATION: The type specimen selected by Fosberg for this taxon is *Rock,* in Nov. 1913 (GH). It was collected on the Manoa Cliff Trail. After carefully examining this specimen, the one designated by Fosberg as type for var. *st.-johnii* (*Forbes,* 7 Oct. 1908 (BISH)), as well as all other available specimens of these taxa, I have come to the conclusion that there is really no way one can separate them, and I have therefore synonymized var. *st.-johnii* with var. *rockii.* The type specimen, which Forbes collected at "Foot of Pali," as well as the other specimen cited by Fosberg for var. *st.-johnii* (*Mann &*

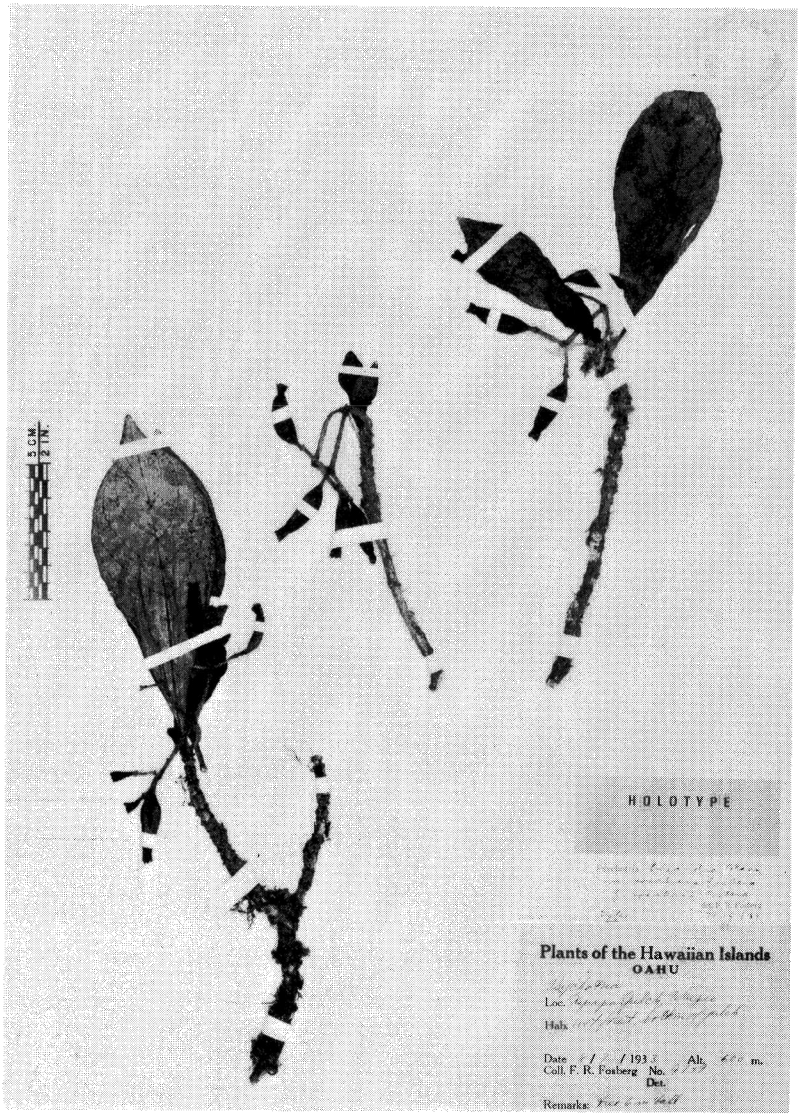


FIGURE 15. *Psychotria hexandra* var. *hosakana* Fosberg, from *Fosberg 9759* (BISH, HOLOTYPE).

Brigham 342), are supposed to differ from var. *rockii* by quadrangular branches in cross section and in inflorescence up to 10 cm. long. I do not think that the character of quadrangular branches alone can successfully distinguish var. *st.-johnii* from var. *rockii*; the size of the inflorescence certainly does not as the two specimens cited for var. *st.-johnii* have the peduncles from negligible to 8 mm. long, which is well within the range for var. *rockii*. The populations from which the specimens cited for these taxa came are probably extinct, as no collections have been made since the early 1940's.

DISTRIBUTION: This variety has (or had) a local distribution, being limited principally to the moist forests of the Manoa Cliff area in the southern Koolaus (FIGURE 9), with some populations once apparently being found in the Nuuanu area. Flowering specimens have been collected beginning in April and fruiting specimens beginning in September.

OAHU: Manoa Cliff area on Mt. Tantalus, *Arneman*, 29 Mar. 1942 (BISH), *Pearsall 98* (BISH, NY, US), *108* (NY, US), *Rock & Ballou*, 2 Sept. 1912 (GH), *Rock*, in Nov. 1913 (GH, HOLOTYPE); "Foot of Pali," *Forbes*, 7 Oct. 1908 (BISH, HOLOTYPE of var. *st.-johnii*); Oahu without exact locality, *Mann & Brigham 342* (BISH), *Remy 326* (P), *Rock 17320* (BISH).

2. **Psychotria grandiflora** Mann in Proc. Amer. Acad. Arts **7:** 170. 1867; Wawra in Flora **57:** 329. 1874; Hillebrand, Fl. Haw. Isl. 181. 1888. FIGURES 1, 17, 20, 21

Straussia grandiflora Caum in Occas. Pap. Bishop Mus. **9**(5): 9. *pl. VII.* 1930.

Small tree or shrub to 5 m. tall, with ovate-deltoid to obovate, caducous stipules 0.5 – 0.8 cm. long, these usually obtuse or rounded at apex, with a thick band of brown hairs in the axil; leaves with petioles 0.1 – 2 cm. long and obovate, infrequently elliptic, coriaceous, revolute blades 1.6 × 4 – 6.3 × 14.1 cm. wide and long, these acute to obtuse at base, obtuse to rounded at apex, often suffused with a carmine pigmentation, glabrous to somewhat pubescent beneath, particularly along midrib, with 6 – 12 pairs of lateral veins and with tertiary veins often conspicuous beneath; inflorescence with one main axis, the peduncle 0.5 – 9.5 (usually over 5) cm. long, often pubescent, usually with 2 nodes with verticillate branching, each branch subtended by a bract which completely encircles the node, the branches of the lower node usually terminated by 3 flowers disposed in a cyme and those of the upper node, if 2 nodes are present, often with but one flower; flowers usually 5-merous, on pedicels 0.1 – 0.6 cm. long, subtended by ovate bracts less than 1 mm. long which are brown-villose within, these bracts often found on secondary peduncles which otherwise appear as continuations of the pedicels; calyx 1 – 2 mm. long, slightly dilated toward the apex and truncate; corolla white, the tube 10 – 22 mm. long, slightly dilated toward the apex, glabrous at the throat, with ovate-deltoid, reflexed lobes 4 – 6 mm. long; stamens exerted at anthesis, the filaments 3 – 4.5 mm. long, inserted ¼ – ⅓ from the base of the 3.5 – 4.5 mm. long anthers; pistil with ovary 3 – 4 mm. long at anthesis, the style 20 – 28 mm. long with 2 small, pubescent stigmas; fruit mostly pyriform, 10 – 15 mm. long at maturity,

FIGURE 16. *Psychotria hexandra* var. *rockii* Fosberg, from *Rock*, in Nov. 1912 (GH, HOLOTYPE).

FIGURE 17. *Psychotria grandiflora* Mann, from *Mann & Brigham 566* (BISH, ISOLECTOTYPE).

capped by the persistent calyx tube, this 1 – 2 mm. long; pyrenes triangular in cross section, usually without invagination of the seed coat on the ventral surface.

TYPIFICATION: Mann referred to his new species as being "very handsome" when he described it. He designated *Mann & Brigham 566* as the type collection but he did not indicate any particular one of several specimens which are part of that collection. I have therefore designated the specimen deposited at GH as the lectotype and those duplicates which are deposited at BISH, NY, and US as isolectotypes. *Straussia grandiflora*, in spite of the epithet, was described by Caum as a new species; it was not a new combination. The type is *Lyon & Duvel 5012L*, from Kokee, Kauai (BISH); the specimen does not significantly differ from Mann's type.

DISTRIBUTION: Found mainly in the high, wet forests of the Kokee area and the Alakai Swamp on Kauai (FIGURE 1). From a review of herbarium specimens it appears that flowering specimens may be found at nearly any time of year, but the actual phenology is unknown at present.

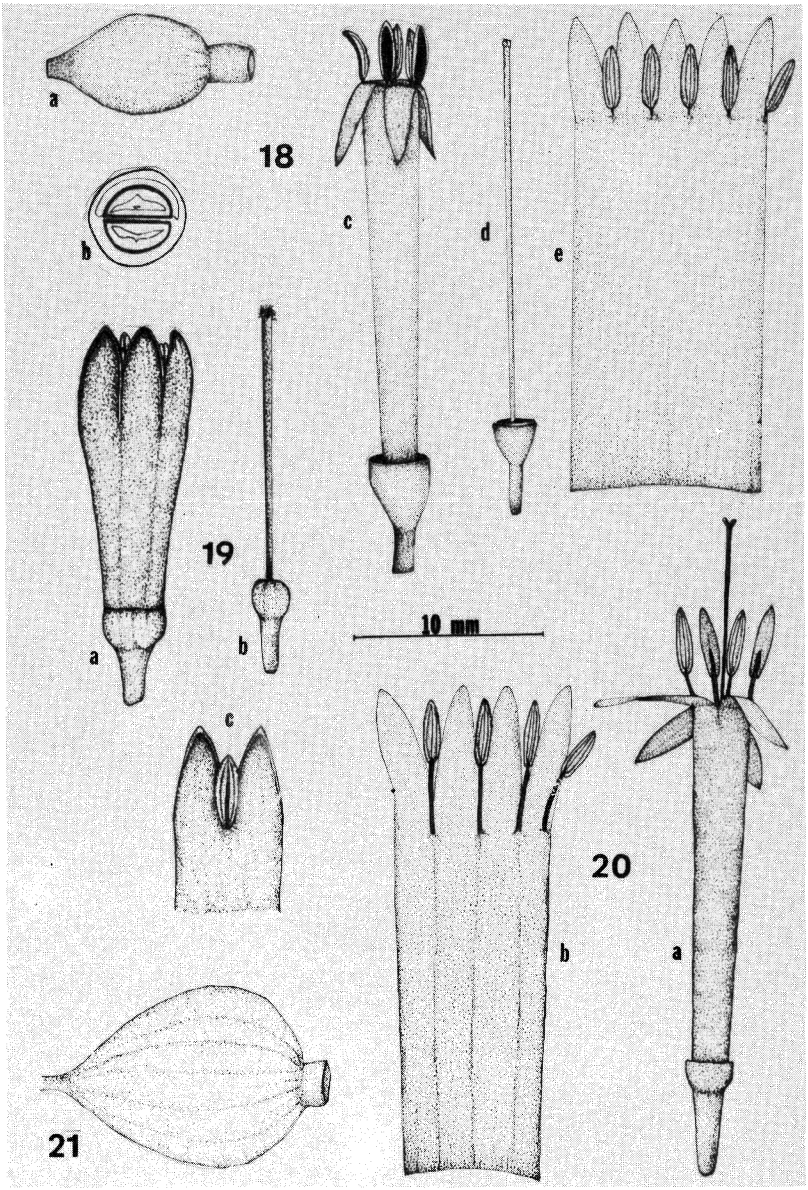
KAUAI: Kokee: Near Kalalau Valley, *Degener 30463* (BISH), *Fosberg 12679* (BISH, US), *Neal,* 17 Aug. 1930 (BISH), *Pettee,* 17 Aug. 1930 (BISH), *St. John et al. 22898* (NY); Kumuwela, *Baxtor,* in Feb. 1939 (MO), *V.O. Fosberg 14* (BISH, F, US); Halemanu, *Kusche 20* (A), *Rock,* in Feb. 1909 (A), *177* (BISH, RSA), *2150* (A), *2243* (GH); Kokee – Haena Road, *Pearsall*, 8 July, 1959 (BISH); Awaawapuhi trail, Honopu, *Woolford 432* (BISH); Kokee, without further data, *Lyon & Duvel 5012L* (BISH, HOLOTYPE *of Straussia grandiflora*), *Wilder 449* (BISH); Waimea, *Forbes 823.K* (BISH), *Mann & Brigham 566* (GH, LECTOTYPE; BISH, NY, US, ISOLECTOTYPES), *St. John et al. 10684* (A, NY, P, US), *St. John, Fosberg, & Oliveira 13704* (BISH); Alakai Swamp, *Stone 1542* (BISH); Kauai without exact locality, *Collector unknown* (GH), *Wawra 2112* (W), *Wilder s.n.* (BISH).

This species is one of the most distinct of the genus in the Hawaiian Islands and probably is the most isolated, genetically speaking. The pendent flowers, with their waxy texture and white color, make the species the most ornamental Hawaiian member of the genus.

3. **Psychotria hobdyi** Sohmer, nom. nov. FIGURES 1, 18, 19, 22.

Psychotria rosacea St. John in Bot. Mag. (Tokyo) **88:** 59. 1975; non Steyermark, 1972.

Trees to 8 m. tall, with grayish brown twigs and broadly ovate stipules to 8 mm. long; leaves with petioles 1.2 – 2.5 cm. long and membranaceous to chartaceous, oblanceolate to narrowly obovate blades, these glabrous to somewhat puberulent beneath, 3.5 × 11.2 – 7.4 × 22.3 cm. wide and long; domatia absent or present (but small) in the axils of the 10 – 13 pairs of lateral veins, these, together with the midrib, often suffused with a pink or rosaceous pigmentation below, this pigmentation apparently sometimes extending to the entire leaf blade; inflorescence with one main axis but this obscured by the often very small peduncle 0.2 – 1 mm. long, with 2 or 3 nodes and verticillate branching, each branch usually terminated by a cymule of 3 flowers, the terminal flower of each cymule on a short pedicel directly from the branch, and the lateral flowers pedicellate from short


a
18
b
c
d
e
19
a
b
10 mm
c
20
b
a
21

tertiary branches or secondary peduncles; small, very early caducous bracts subtending all of the inflorescence branches; flowers 4- or 5-merous; calyx cupular, 2.5 – 3.5 mm. long (including hypanthium), about as wide, somewhat or not at all expanded toward the summit, practically truncate at the apex; corolla with tube slightly expanded toward the summit, 20 – 24 mm. long, glabrous at the throat, the lobes ovate-subulate, 4.5 – 5.5 mm. long and reflexed at anthesis; pistil with ovary (including terminal disc) about 5 mm. long at anthesis, a narrow style 17 – 20 mm. long, and small and pubescent stigmas (unopened in functionally staminate flowers); fruit globose-ellipsoid or fusiform, 8 – 9 mm. long, capped by persistent calyx tube 2 – 3 mm. long; pyrenes basically triangular in cross section with a small "T"-shaped invagination of the seed coat on the ventral side.

TYPIFICATION: The specific epithet for this taxon chosen by St. John being a later homonym, I have provided a new name based on the collector of the type specimen *(Hobdy 205)*. As St. John did not distinguish between the two sheets of this collection on deposit at BISH when he designated a holotype, I have had to designate one of these sheets as LECTOTYPE. The specimen I have so designated is the one bearing fruit (FIGURE 22). I have not been able to see the *Hobdy 506* collection cited by St. John from the same area.

DISTRIBUTION: This species has a very localized distribution in the Milolii – Kopiwai area of Kauai in moist, shaded forest (FIGURE 1). The flowering specimens available were collected in August. The type collection, obtained during October, was in both flower and fruit.

KAUAI: Mahanaloa Valley, *Gagné & Montgomery 535* (BISH), *Hobdy 205* (BISH, LECTOTYPE; BISH, ISOLECTOTYPE); Mahanaloa Valley near junction with Kuia Valley, *Fay 220* (PTBG), *Herbst, Gagné, Montgomery, & Mull 2824* (US); SW side of Mt. Kahili, near summit, *Herbst 2438* (US).

The species is distinguishable from *Psychotria grandiflora*, the nearest relative, by the nature of the inflorescence and leaves. The inflorescence here has a very small peduncle compared to that of *P. grandiflora*, and the leaf blades in *P. hobdyi* are membranaceous and much larger than those usually found in *P. grandiflora*. This species probably represents a localized radiation from *P. grandiflora*. *Psychotria hobdyi* is probably dimorphic and functionally dioecious, but it is difficult to state this with any certainty due to the limited number of specimens available for study. The

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FIGURES 18 – 21. Variation in flower and fruit morphology in Hawaiian *Psychotria*: 18 & 19, *P. hobdyi*: 18, from *Hobdy 205* (BISH, LECTOTYPE), entire fruit (a), with cross section showing shrunken contents (b), entire, probably staminate, flower (c) with detail of pistil (d) and with corolla laid flat to expose inner surface of the tube (e); 19, *Gagné & Montgomery 535* (BISH), flower somewhat before anthesis (a) with detail of pistil (b); 20 & 21, *P. grandiflora:* 20, from *Baxter s.n.* (MO), entire, probably staminate, flower (a) with corolla removed and laid flat to expose inner surface of tube (b); 21, mature fruit, from *Forbes 815.K* (BISH).

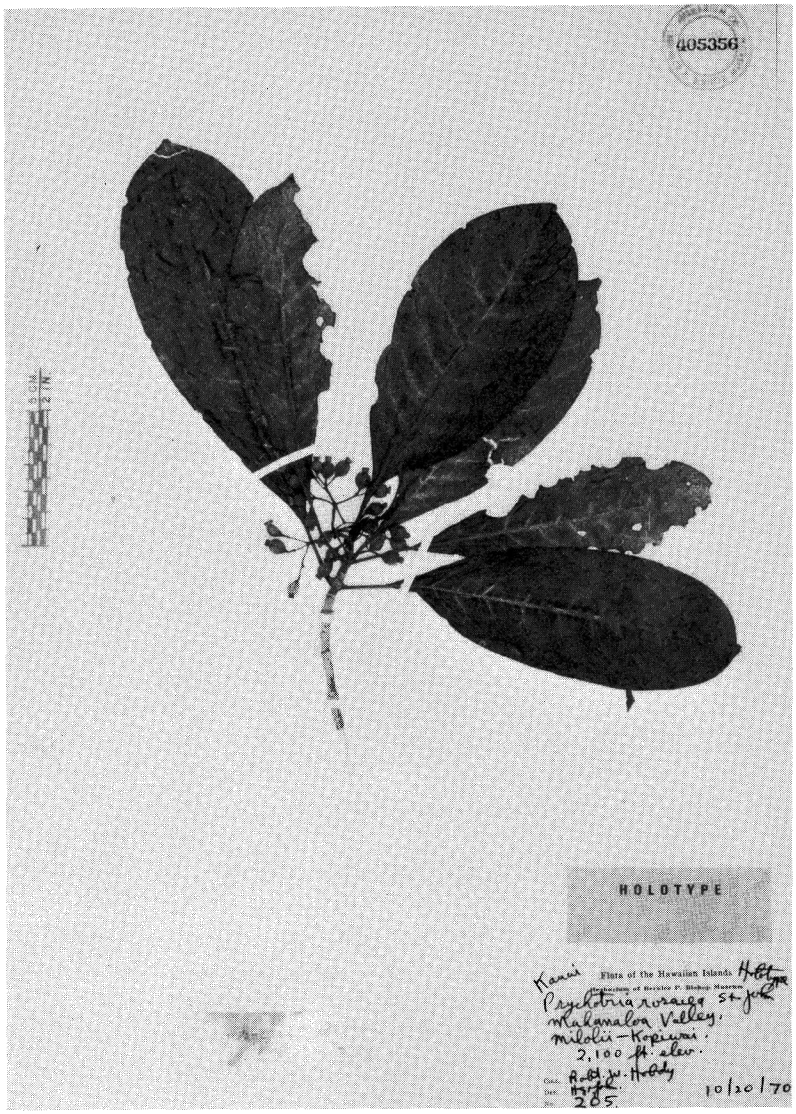


FIGURE 22. *Psychotria hobdyi* Sohmer, from *Hobdy 205* (BISH, LECTOTYPE).

anthers in the type collection have pollen, but the superficially good fruit have shrunken and probably sterile pyrenes (FIGURE 18). FIGURE 19 illustrates the structure of a staminate flower.

Psychotria section **Straussia** (A. Gray) Fosberg in Brittonia **16:** 264. 1964.

Straussia A. Gray in Proc. Amer. Acad. Arts **4:** 42. 1858; Hillebrand, Fl. Haw. Isl. 178. 1888; Heller in Minnesota Bot Stud. **1:** 903. 1897; Rock, Indig. Trees Haw. Isl. 445. 1913; Skottsberg in Ark. Bot. **31A** (4): 17. 1944.

Trees or shrubs with ovate stipules with axilliary pubescence; leaves petiolate or sessile, the blades obovate to rotund; inflorescence usually with one main axis with 1 to several nodes and verticillate branching, the ultimate branches terminating in cymules of sessile or pedicellate flowers or a single flower, sometimes the peduncle short and the inflorescence appearing sessile or, infrequently, the inflorescence appearing glomerate or globose; flowers 4- or 5-merous, rarely 6-merous, often dimorphic and always at least functionally dioecious; staminate flowers generally not producing mature fertile fruit; pistillate flowers with sterile, diminutive stamens (=staminodes); calyx glabrous or hirsute, the tube short and dilated toward the summit or not at all dilated, truncate at apex or with acute to obtuse lobes; corolla with a short tube usually less than 3 mm. long, with thin or very thick lobes shorter than, equalling, or infrequently surpassing the tube, the lobes sometimes hirsute, particularly at apex; stamens with filaments basifixed to the anthers, these less than 2.5 mm. long; pistils (of pistillate individuals) with styles less than 6 mm. long, usually much shorter, with 2 glabrous or pubescent short stigmas; fruit ovoid to obovoid, the pyrenes usually semicircular in cross section and usually with a "T"-shaped invagination of the seed coat on the inner or ventral surface.

TYPIFICATION: Gray did not indicate a type species for his new genus, but Fosberg so designated *Psychotria kaduana* when he reduced *Straussia* to a section of the genus *Psychotria*.

DISTRIBUTION: Members of this section are found on all of the present day main Hawaiian Islands. Their ecological range is much greater than that shown by members of section *Pelagomapouria*.

The members of this section are well set apart from those of section *Pelagomapouria* by the basifixed anthers, much smaller flowers, and the inflorescences, which always possess verticillate branching rather than the dichotomous or trichotomous branching demonstrated by some members of *Pelagomapouria*. I am in agreement with Fosberg as to the derivation of members of section *Straussia* from what has previously been called *Grumilea*, now usually treated as a section of the genus *Psychotria*, a southwestern Pacific group. The "T"-shaped invagination that appears on the ventral or inner sides of all the seeds produced in section *Straussia* is apparently a remnant of previously more extensive ruminations, shown today by most members of section *Grumilea*.

KEY TO SPECIES OF SECTION STRAUSSIA

Flowers usually glabrous, the corolla lobes usually 4 – 6.5 mm. long; leaves with blades tending to be oblanceolate-elliptic, often obtuse at both ends (Kauai). 4. *P. psychotrioides*

Flowers glabrous, pubescent, or hirsute, the corolla lobes usually less than 4 mm. long; leaves with blades various.

Leaves with blades 8 – 29.5 (usually over 15) cm. long, usually coriaceous and revolute, the petioles 0.2 – 2 cm. long; fruit with narrow persistent calyx tube at summit (Kauai). 5. *P. wawrae*

Leaves various but usually with blades less than 12 cm. long, membranaceous, chartaceous, or coriaceous and plane or revolute; fruit often with persistent calyx tube nearly as wide as the apex of the fruit.

Flowers with the calyx, as well as often also the tips of the corolla lobes, whitish or yellowish hirsute, often densely so; leaves sessile or petiolate, the blades tending to elliptic-oblong (Oahu, Waianae Mts.) ..... 8. *P. hathewayi*

Flowers with the calyx glabrous or, if hirsute, usually never densely so, and with hairs usually a reddish or rusty color; corolla lobes rarely pubescent or hirsute; leaves various.

Leaves sessile or nearly so, the blades usually very stiffly coriaceous, with venation strongly ridged below, drying a conspicuous orange-brown (Oahu, Koolau Mts.). 9. *P. fauriei*

Leaves sessile or petiolate, the blades membranaceous to coriaceous, but never stiffly so, with venation below never strongly ridged, although sometimes conspicuous.

Blades of leaves elliptic or elliptic-obovate, tending to orbicular, obtuse or rounded at both ends; domatia not present or inconspicuous; inflorescence rarely pendent (Molokai, Lanai, Maui) ..... 10. *P. mauiensis*

Blades of leaves usually obovate to oblanceolate, acute to acuminate at base; domatia often conspicuous beneath; inflorescence sometimes pendent on relatively long peduncles.

Fruit 6 – 10 (usually less than 8) mm. long; inflorescence usually with 3 – 4 orders of branching (Molokai, Maui, Hawaii) ..... 11. *P. hawaiiensis*

Fruit usually over 8 mm. long or, if smaller, the inflorescence glabrous, never with more than 2 or 3 orders of branching, and/or the fruit with a thin disc protruding conspicuously from within the persistent calyx.

Leaves usually with stout, well defined petioles and obovate to oblanceolate blades, these often tapering into an acuminate or attenuate base, often coriaceous; domatia frequently conspicuous beneath; inflorescence not pendent and usually with a robust peduncle (Kauai, Oahu, Molokai, Lanai, Maui) ..... 6. *P. mariniana*

Leaves usually with slender petioles or none, the blades obovate to elliptic, acute or obtuse at base, usually membranaceous to chartaceous, with margins plane or with marginal ribs; domatia usually small and inconspicuous beneath; inflorescence frequently pendent and with slender peduncles (Kauai, Oahu, Molokai, Maui) ..... 7. *P. kaduana*

4. **Psychotria psychotrioides** (Heller) Fosberg in Brittonia **16:** 269. 1964 ..... FIGURES 23 – 30.

Straussia psychotrioides Heller in Minnesota Bot. Stud. **1:** 904. 1897.
Psychotria greenwelliae Fosberg in Brittonia **16:** 269. 1964.
Straussia oncocarpa var. β Hillebrand, Fl. Haw. Isl. 180. 1888.?

Slender trees to 5 m. tall, with young branches chestnut to grayish brown and 1 – 3 mm. wide as measured below the inflorescence, the stipules to 8 mm. long, often with elongated apices; leaves with petioles 0.2 – 2.5 cm.

FIGURE 23. *Psychotria psychotrioides* (Heller) Fosberg, from *Heller 2885* (BISH, HOLOTYPE).

long and obovate, oblanceolate-oblong, or elliptic-oblong, thickly or thinly coriaceous blades 1.5 × 2.2 – 7 × 14 cm. wide and long, these mostly glabrous, infrequently hirtellous, particularly in the axils of the 6 – 11 lateral veins per side, the domatia small, when present often with whitish or brownish hairs within them, the secondary veins and reticulations often conspicuous; inflorescence with one main axis with 1 or 2 nodes with verticillate branching, the branches usually less than 5 mm. long and usually terminating in cymules of 3 flowers with the central, and oldest, flower of each sessile on the branches and the 2 laterals on short pedicels, the branches subtended by small, early caducous bracts; flowers 4- or 5-merous, usually dimorphic and either functionally staminate or pistillate; calyx 1 – 2 mm. long (not including hypanthium), about as broad, often flared toward apex, this either truncate or with very small rounded lobes; corolla with tube slightly expanded toward the apex, glabrous at the throat, to 3 mm. long, smaller than the 4 – 6.5 mm. long, ovate or lanceolate, strongly reflexed lobes; stamens at anthesis with filaments to 2.5 mm. long (in staminate individuals), these affixed to the base of the 1.5 – 2 mm. long, oblong anthers; pistil (in functionally pistillate individuals) with ovary (including terminal disc) 2 – 4 mm. long and style 5 – 6 mm. long, the stigmas puberulent or papillose, 1 – 2 mm. long; fruit globose-pyriform, 10 – 13 mm. long (those produced on functionally staminate individuals usually with shrunken or aborted contents), often with a broad disc at the apex; pyrenes semicircular in cross section, usually with a large "T"-shaped invagination of the seed coat on the ventral side.

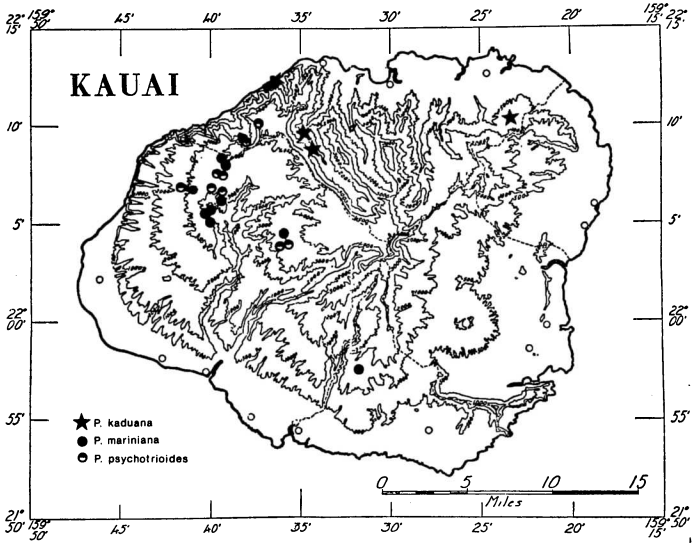


FIGURE 24. Distribution of *Psychotria kaduana, P. mariniana,* and *P. psychotrioides* on the island of Kauai.

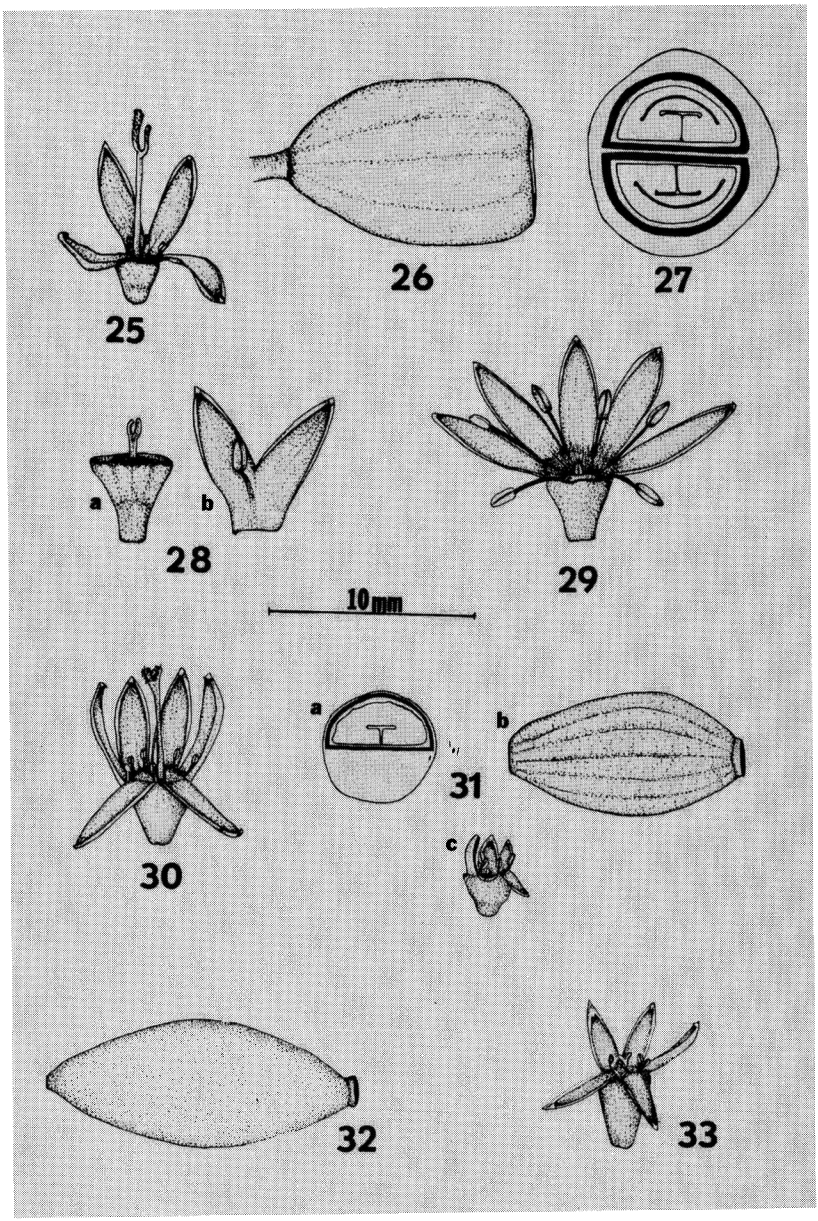
TYPIFICATION: Heller characterized his species as having flowers larger than those of any other species of *Straussia*, which was the reason for the epithet, as well as certain qualities possessed by the leaves of the living plant which he could not quite explain ("They have a grayish, semi-transparent aspect, which is not at all brought out in dried specimens"). The type collection *(Heller 2885)* was made in Kaholuamano, Kauai, and as Heller collected well and copiously there are a number of duplicate sheets. I have designated the sheet at BISH as lectotype (FIGURE 23) and have examined sheets from F, GH, MO, NY, and US, which are isolectotypes.

Fosberg's species *Psychotria greenwelliae* was based on *Degener & Greenwell 21563*, which was collected east of the Waineke Swamp on Kumuweia Ridge, Kauai. The holotype is at BISH, and I have also seen isotypes from NY and US. After studying the specimens cited by Fosberg I came to the realization that they represent pistillate individuals. Dioecism and sexual dimorphism are well established in this species; the staminate flowers are usually larger, on the average, than the pistillate flowers (FIGURES 25 and 29). This is mainly due to a difference in corolla shape and size. The staminate individuals will often have fruit, but these usually turn out to be sterile, with aborted or shrunken contents, and are smaller than the "legitimate" fruit produced by the pistillate individuals (FIGURES 26 and 27). Fosberg listed the diagnostic features of *P. greenwelliae* as smaller flowers and larger fruit than in *P. psychotrioides*. The shape and size of the leaves in *P. psychotrioides* are so relatively variable that such features cannot be utilized to separate *P. greenwelliae* from *P. psychotrioides*. I have therefore reduced the former to synonymy.

I have seen no trace of any specimens collected or annotated by Hillebrand for his taxon *Straussia oncocarpa* var. β. I have little doubt, however, that the taxon he so designated belongs here. His description is clear and cannot describe anything other than an individual of *P. psychotrioides* ("Leaves obovate-oblong and rounded...panicle very short, ..., and contracted. Corolla...lobes 2 to 3 times longer than the short tube."). The type locality also is reasonable, for he lists Waimea, Kauai, and this doubtless meant the highlands facing Waimea.

DISTRIBUTION: Found principally on the Kokee Plateau of Kauai in wet forest (FIGURE 24). Flowering specimens have been gathered from July through October.

KAUAI: Kalalau Valley, SE rim, *Degener & Degener 23857* (US); E rim, *Degener & Degener 27700* (BISH, NY, US, W), *Degener & Hatheway 20486* (US); Kokee: Kalalau Overlook, *Carlson 3723* (F), *Stone 3767* (BISH); NE of Kalalau Overlook, *Degener & Hatheway 20489* (BISH, NY, US, W); in forest along road to Kalalau Overlook, *Stone 855-A* (BISH); Kaluapuhi Trail, *Wichman & Chock 1136* (BISH); Kokee area: Near forest ranger station, *Carlquist 514* (RSA), *Henrickson 4050* (BISH, RSA), *Stern & Carlquist 1273* (RSA, US), *1295* (RSA, US); Waialae Stream near ranger station, *Skottsberg 3088* (BISH); Awaawapuhi Ridge, *Bishop & Herbst 1290* (HAW); Kumuela Ditch Trail near Na Pali Kona Forest Reserve, *Crosby & Anderson 2030* (BISH, GH); Kaului Puki Trail, *Spence 179* (BISH); Kauhao Nature Trail, *Herbst 2016* (BISH, PTBG);


25
26
27
a
b
28
29
10mm
30
a
31
b
c
32
33

Kauaikinana Stream, *Stone 3390* (BISH); Kumuwela Ridge E of Waineke Swamp, *Degener & Greenwell 21563* (BISH, HOLOTYPE of *P. greenwelliae*, NY, US, ISOTYPES); Halemanu, *Meebold 26309* (BISH); Kokee without specific locality, *Degener & Degener 27698* (NY, US); Na Pali Kona Forest Reserve, Mohihi Road at Kauaikinana Stream, *Chock 953* (BISH); Mohihi Rd. at Keaku Stream, *Chock 960* (BISH); SW of Kumuwela and Waininiua Rd. junction, *Laidlaw & Wichman 1114* (BISH); Kokee – Alakai Swamp Road, *Baxter* in Feb. 1939 (MO); Waimea Drainage Basin, W side, *Forbes 779.K* (BISH), *781.K* (BISH), *1090.K* (BISH); Waimea, near Kokee, *St. John et al. 10700* (NY); Kaholuamano, *Forbes 436.K* (BISH), *436a.K* (BISH), *Heller 2836* (F, US), *2885* (BISH, LECTOTYPE; GH, MIN, MO, NY, US, ISOLECTOTYPES), *Hitchcock 15307* (US), *Rock 5346* (GH), *5347* (A), in Oct. 1916 (BISH); Halemanu – Kaholuamano, *Kusche 11*? (A); Kauai without further data, *Pearsall*, 30 Jun. 1959 (BISH); no data but obviously from Kauai, *Rock 17264* (A, BISH), *17266* (A, BISH).

This species can be distinguished from other members of the section by its relatively large corollas.

5. **Psychotria wawrae** Sohmer, nom. nov. FIGURES 1, 31 – 35.

Straussia kaduana var. *grandifolia* Wawra in Flora **57:** 321. 1874.

Tree to 5 m. tall, with yellowish to dark brown branches 3 – 8 mm. wide below the apex, the stipules ovate-deltoid, to 10 mm. long, often with the tip extended into a point; leaves with blades sessile or with petioles 0.2 – 2 cm. long, stout, the blades coriaceous, oblanceolate-obovate, mostly glabrous, 4 × 8.5 – 10.1 × 29.2 cm. wide and long, attenuate to obtuse to nearly cordate at base, rounded or obtuse at apex and usually with a thick, stout point, the domatia none or extremely small and inconspicuous, the lateral veins 12 – 15 to a side; inflorescence with one main axis with peduncle 1.8 – 10 cm. long, the nodes 1 or 2, each with verticillate branching, the branches 0.8 – 2 cm. long and again verticillately branched or terminating in a cymule of 3 flowers with the central flower of each cymule usually sessile and the lateral 2 on short pedicels; flowers functionally either staminate or pistillate; calyx extremely small, 0.5 – 1.5 mm. long at anthesis (not including the hypanthium about as long), slightly expanded at the summit, truncate or very slightly lobed; corolla rotate with tube less than 2 mm. long and slightly expanded toward the apex, glabrous at the throat, the lobes ovate, to 3 mm. long; stamens with filaments at anthesis 1 – 1.5 mm. long affixed to the base of the narrow, oblong, 0.5 – 1 mm. long anthers (staminodes only in pistillate individuals); pistil with ovary to 1 mm. long and style about the same length, the stigmas 0.2 – 0.5 mm. long and divaricate (smaller and appressed in the functionally staminate individuals); fruit 7 — 15 mm. long, pyriform, the short, persistent calyx crowning the

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FIGURES 25 – 33. Flower and fruit morphology in Hawaiian *Psychotria*: 25 – 30, *P. psychotrioides*: 25, pistillate flower, from *Forbes 779.K* (BISH); 26, mature fruit, from *Wichman & Cook 1136* (BISH); 27, cross section of mature fruit, from *Chock 953* (BISH); 28, from *Pearsall s.n.* (BISH), staminate flower with corolla removed (a), portion of the corolla showing inner surface of corolla tube (b); 29, staminate flower, from *Forbes 436.K* (BISH); 30, pistillate flower showing staminodes, from *Herbst 2016* (BISH); 31 – 33, *P. wawrae*: 31, from *Forbes 137.K* (BISH), cross section of fruit (a), entire fruit (b), and staminate flower (c); 32, mature fruit, from *Mann & Brigham 563* (GH); 33, pistillate flower, from *Faurie 392* (A).

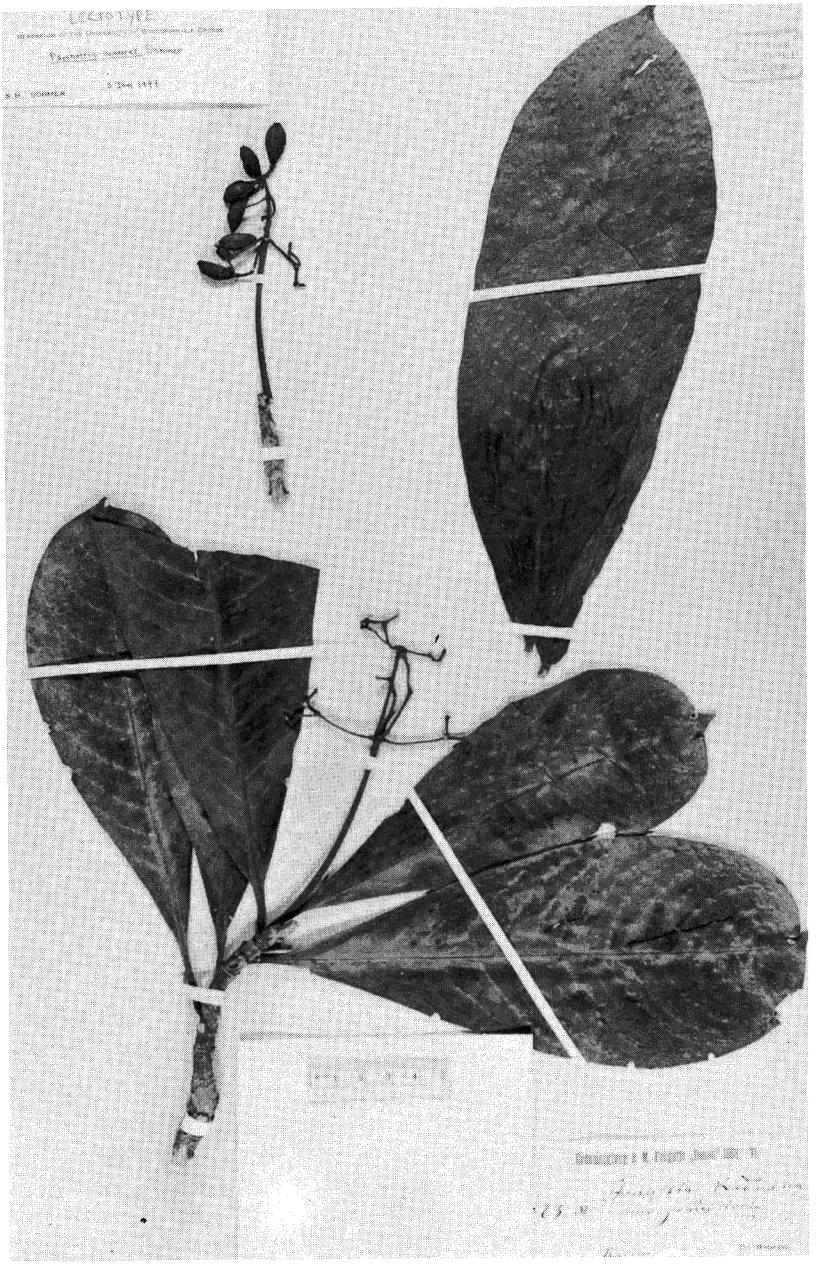


FIGURE 34. *Psychotria wawrae* Sohmer, from *Wawra 2023* (W, LECTOTYPE).

apex less than 1 mm. long and usually very narrow; pyrenes semicircular in cross section, with a large "T"-shaped invagination of the seed coat on the ventral side.

TYPIFICATION: Wawra made the type collection *(2023)* in the "Hochwälder um Kealia" on Kauai during the voyage of the *Donau*; it is deposited at W. The lectotype (FIGURE 34) demonstrates both the large size of the leaf blades and the short stout petioles in this species. Apparently the taxon was forgotten almost as soon as it was described, for it had not appeared in the literature again since Wawra's publication. I had realized that a distinct taxon existed on Kauai, but had not realized that it was the same as Wawra's until I was able to examine the type collection. There are two sheets of this collection at W; I have therefore designated one as the lectotype and the other as an isolectotype.

At the rank of species, Wawra's epithet *grandifolia* may not be used, as that epithet has already been preempted for another species of *Psychotria*. I have therefore, as the epithet itself makes self-evident, provided a new name for this species which honors the individual who first described it.

DISTRIBUTION: Found principally at 150 – 500 m. in the moist forests of northern Kauai (FIGURE 1). Flowering specimens have been gathered in March and flowering appears to continue through August. Fruiting specimens have been gathered beginning in September.

KAUAI: Hanakapiai, *St. John & Fosberg 13876* (BISH); Wainiha Valley, *St. John & Fosberg 13930* (BISH), *13932* (BISH), *13937* (BISH), *13940* (BISH); Waioli Valley, *Forbes 120.K* (BISH); Kealia, *Mann & Brigham 563* (BISH, F, GH, US), *Wawra 2023* (W, LECTOTYPE; W, ISOLECTOTYPE); Power Line Trail, *Fay 433* (PTBG, UWL), *Forbes 137.K* (BISH), *St. John et al. 10953* (BISH), *10954* (BISH), *10960* (BISH), *10966* (BISH); Kilauea, *Faurie 387* (A), *392* (A), *393* (A); near Ka Loko Reservoir, *Landgraf 1* (BISH); Hanalei, *Faurie 389* (A), *391* (A); Hanapepe Falls, *Faurie 388* (A), *390* (A); Kauai without specific or certain locality, *Mann & Brigham s.n.* (A, photograph), *Forbes 688.K* (BISH).

This species, except for the size and shape of the leaves, and the pronounced narrowly cylindrical calyx tube crowning the fruit, would be placed with *P. mariniana*, and most of the specimens cited above had been identified as members of the latter. Not only are the leaves often larger than in any other taxon of *Psychotria* in the Hawaiian Islands (FIGURE 35), but they are often nearly sessile on very short stout petioles. These features alone, when they occur, differentiate *P. wawrae* from *P. mariniana*. Hybridization between the two species is suspected and probably accounts for some of the intergradation of individuals that exists between them, such as *Forbes 632a.K* (BISH, W) and *Fay et al. 335* (PTBG), for two examples.

6. **Psychotria mariniana** (Chamisso & Schlechtendal) Fosberg in Brittonia **16:** 265. 1964. FIGURES 24, 36 – 51.

Coffea mariniana Chamisso Schlechtendal in Linnaea **4:** 35. 1829.
Straussia mariniana A. Gray in Proc. Amer. Acad. Arts **4:** 43. 1858.
Psychotria hawaiiensis var. *glabrithyrsa* Fosberg in Brittonia **16:** 271. 1964.

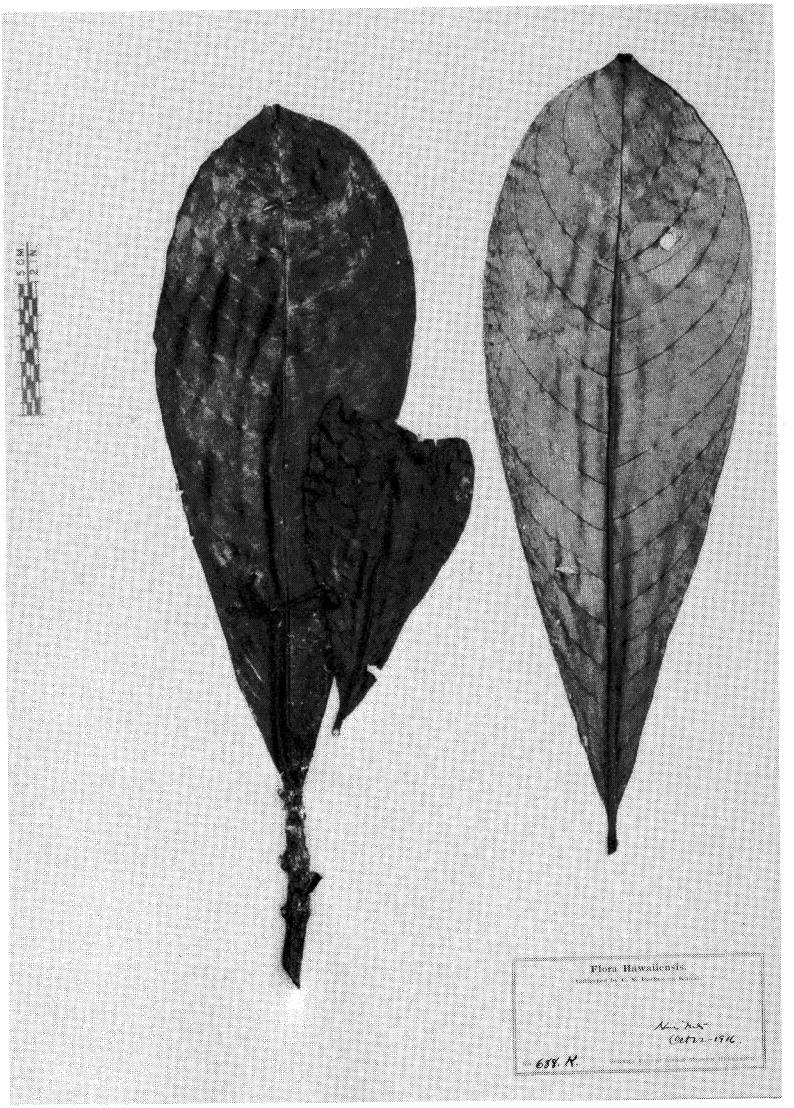


FIGURE 35. *Psychotria wawrae* Sohmer, from *Forbes 688.K* (BISH); specimen illustrates the large length to which leaves in this taxon can develop.

Trees, small or up to 25 m. tall, with yellowish to dark brown twigs 3 – 5 mm. wide below the apex, the stipules broadly ovate to obovate, often as broad as long or broader, to 10 mm. long; leaves with petioles 0.5 – 3.3 cm. long and coriaceous, narrowly oblanceolate to obovate blades 1.5 × 5 – 6 × 13 cm. wide and long, these usually acuminate or attenuate at the base, acute to obtuse, rounded, obtuse, or acute at the apex, often with an obtuse, abrupt point, usually glabrous below except for the domatia, these usually present and often very conspicuous (to 3 mm. long, particularly in the Kauai and some Oahu representatives) and usually filled with whitish hairs, in the axils of the 7 – 12 lateral veins to a side, the marginal ribs often developed; inflorescence with one main axis with 2 or 3 nodes, usually with verticillate branching, the peduncle 1.2 – 6.2 cm. long, and 0.8 – 3 mm. wide, usually not nodding, with branches 0.2 – 2.2 cm. long, those of the upper node or nodes much smaller than those of the lowest or first node; flowers 4-, 5-, or 6-merous, functionally unisexual, the calyx 1.5 – 4 mm. long (including the hypanthium), somewhat or not at all dilated toward the apex, glabrous, usually thick and fleshy, truncate or with the barest indication of lobes; corolla with tube 1 – 2.5 mm. long, barely or not at all expanded toward the apex, glabrous or pubescent at the throat with broadly ovate, usually thick and fleshy, reflexed lobes; stamens (of functionally staminate individuals) with filaments to 1 mm. long at anthesis, affixed to the base of the 1 – 1.2 mm. long, ovate-oblong anthers; pistil (of functionally pistillate individuals) with ovary 1.2 – 2.5 mm. long and usually top-shaped, the style 0.5 – 0.8 mm. long with 2 thick glabrous or papillose stigmas about as long as the style or a little smaller, fruit pyriform to oblong-globose, 10 – 12 mm. long, the pyrenes semicircular in cross section and usually with a "T"-shaped invagination of the seed coat on the ventral surface.

TYPIFICATION: The type specimen was collected on the island of Oahu and had been in the Leningrad herbarium. Dr. Fosberg borrowed the specimen from Leningrad for examination shortly before the Second World War. He returned the specimen after the war to the Russian Embassy for safe transport back to Leningrad (pers. com.). The specimen has been lost to view since then. As Fosberg was the last individual to have studied the Hawaiian *Psychotriae* and to have examined this holotype, I asked him to select a specimen which best matched his recollection of it. The specimen he selected is *Russ*, 1 June 1933 (BISH) (FIGURE 36). It was collected near the trail in the west branch of Kaeleku. I have designated this specimen the neotype and hope that the holotype will eventually turn up and supersede this specimen.

Although the neotype represents an individual which is definitely a member of this taxon known as *P. mariniana*, it is no doubt the result of a certain amount of introgressive hybridization that has occurred in the southern Koolaus, wherein the holotype was obtained.

After examining the type collection for Fosberg's taxon *P. hawaiiensis* var. *glabrithyrsa*, I have come to the conclusion that it is representative of elements of *P. mariniana*. The inflorescence of the type collection *(Degener, Greenwell & Hatheway 21146)* resembles the inflorescence of *P. hawaiiensis*

FIGURE 36. *Psychotria mariniana* (Chamisso & Schlechtendal) Fosberg, from *Russ*, 1 July, 1938 (BISH, NEOTYPE).

in the number of orders of branching, but it is not unusual in that respect. All other collections I have examined from the type locality, or nearby, are also members of *P. mariniana*.

DISTRIBUTION: Widely distributed in wet to relatively dry forests of the islands of Kauai, Oahu, Lanai, Molokai, and Maui (FIGURES 24, 37 – 39). The species is as variable in habitat as it is in morphology, being found in the high, wet forests of the Kokee plateau and such drier areas as the forests of the southern Waianaes. In the latter area it can develop into huge trees (for the genus *Psychotria*), up to and over 20 m. in height. Flowering specimens have been obtained, at least sporadically, throughout much of the year, but with peaks that occur principally during the spring and summer months.

KAUAI: Mohihi Road, *Chock 403* (BISH); between Kokee Station and Kitohana, *Skottsberg 966* (BISH); above Kumuwela, *Stone 3397* (BISH), *3386* (BISH); Kumuwela Ridge, *St. John, Fosberg, & Oliviera 13843* (BISH); Kumuwela Lookout Rd., *Baxter 2139* (MO); near Kokee Ranger Station, *Stern & Carlquist 1274* (BISH, RSA); Kokee, without specific locality, *Herbst 1052* (BISH, HAW); Waimea drainage basin, west side, *Forbes 979.K* (BISH); Waimea Canyon 1 mi. east of Kokee Ranger Station, *Henrickson 4031* (RSA), *4046* (BISH, RSA); Waimea without further data, *Mann & Brigham 567* (GH, NY), *St. John et al. 10700* (BISH); Koloa, edge of Wahiawa Bog, *Fay & Higa 249* (PTBG), *Herat & Herat 321* (BISH); Puu Kapele, *Rock s.n.* (BISH), *Stern & Carlquist 2929* (RSA); between Hanapepe and Wahiawa Rivers, *Heller 2565* (F); Makaweli, *Rock 5353* (BISH), *5833* (GH), *5834* (BISH), *Stern & Herbst 2929* (PTBG); Kaholuamano, *Forbes 317.K* (BISH), *514.K* (BISH), *Hitchock 15320* (US), *15350* (US), *15358* (US), *15383* (US), *15538* (US), *Rock 5346* (GH), *5347* (A), *5352* (BISH, GH); Haupu Ridge east of Kipu Road, *Fay & Perlman 362* (PTBG); northwest of Kalaheo, *Henrickson 4063* (RSA); Kauai without specific locality, *Rock 5348* (BISH); without data but most likely from Kauai: *Rock 17265* (BISH).

OAHU: Waianae Mts.: Central Makaleha Ridge, east slope, *Hatheway & Degener 187* (US); Makaleha Valley, *Rock s.n.* (US); Mokuleia, slopes of Koola, *Forbes 1809.0* (BISH); Kamaleunu Ridge, *Nagata, Obata, & Hoe 1131* (BISH); Makaha Valley, *St. John 11593* (BISH); Kunia – Puu Kanehoa Trail, *Thorne 33355* (RSA); Kaluaa Gulch, *Sohmer 5992* (HAW), *6429* (UWL), *10838* (UWL), *10844* (UWL), *10846* (UWL), *10847* (UWL), *10849* (UWL), *10860* (UWL); Puu Kanehoa, *Gosline 101* (HAW), *Hume 130* (BISH, NY, RSA), *Kondo*, 12 May 1946 (BISH), *St. John 10602* (BISH, NY); between Mauna Kapu and Palikea, *Degener & Silva 21027* (NY, US); cliffs at head of Nanakuli Valley, *Fosberg 29783* (NY, US), *29789* (BISH, US, NY), *29792* (BISH, US). Koolau Mts.: Oio – Paumalo Trail, *Degener 13010* (NY, US), *13011* (US); Kahuku Army Trail, *Russ*, 19 Jul. 1930 (BISH); Pupukea Forest Reserve, *Skottsberg 1811* (BISH), Pupukea – Kahuku Trail, *Baxter* in Apr. 1939 (MO), *Nakamoto 37* (HAW); Pupukea – Malaekahama Trail, *Lyon*, 15 Sept. 1926 (BISH); Laie – Waimea, *St. John 13085* (BISH); Waipilopilo, *Degener 13006* (US); Kawailoa, Anahulu Trail, *Webster 1148* (BISH); north fork of Kaukouahua Gulch, *Rock & Hosurer*, 15 May 1909 (BISH); Kawaiiki Ditch Trail, *Gupta 94* (HAW), *95* (HAW), *Lee 9* (HAW); south Opaeula Gulch, *St. John 10614* (BISH); Opaeula Ridge, *Suehiro*, 25 Sept. 1932 (BISH); Poamoho Trail, Paalaa – Uka – Wahiawa, *Chock 12* (BISH), *Chock & Fujita 72* (BISH); Poamoho Stream, *Degener & Murashige 19722* (F, NY, US), *Degener, Clay, & Murashige 19738* (NY, US, W); Castle Trail, *Baxter*, in Nov. 1938 (MO), *Nagata 847* (US), *Stern 1354* (RSA, US), *Stone 1163* (BISH); Punaluu Mts., *Rock 165* (BISH); above Waikane Camp, *Iltis, Ewan, Royen, & Anderson 323* (BISH, US); Waikane Mts., *Rock 1280* (BISH); Kahana Valley, Schofield Trail, *Rathburn & Degener 19800*; Waipio Valley, *Forbes 1598* (BISH); south ridge of Kipapa Gulch, Waipio, *Bryan, Suehiro, & Fukuda*, 15 May 1932 (BISH), *Hasegana*, 15 May 1932 (BISH), *St. John 9963* (BISH), *10035* (BISH); southeast ridge of Kipapa Gulch, Waipio, *Grant 7084* (BISH); Kipapa Gulch Trail, *Cowan 89* (NY), *Hosaka 1036* (BISH), *Ochikubo 21* (HAW), *Oliveira 8* (A, US); Kipapa – Waiawa Ridge, *Kondo*, 14 Apr. 1946 (BISH); ridge east of Puu Kamana, *St. John 11671* (BISH); Waimano Home, *Kerr 1* (BISH); Waimano Trail, *Bryan 1522* (BISH), *Kruckeberg 38* (NY), *St. John 20212* (BISH); ridges behind Pearl City, *Forbes 1461.0* (BISH); Kapalama – Waolani Ridge, *Ewart 18* (BISH); west side of Nuuanu Valley, *Forbes*, 25 July 1908 (NY); Pauoa flats,

Sussell s.n. (BISH); Konahuanui, *Christophersen, Wilder, & Hume 1742* (BISH), *Heller 2267* (F, GH, NY, US), *Rock 2173* (GH); Mt. Olympus, *Kraebele s.n.*; Manoa Cliff Trail, *Lamoureux 276* (HAW), *Swezey*, 18 Nov. 1934 (BISH), *Thorne 33381* (RSA); trail above Woodlawn leading to Waahila Ridge, *Crosby & Anderson 1721* (GH); Palolo, *Rock & Shaw 17265* (BISH); Waialae Nui Ridge, *Degener & Nihei 20228* (NY, US, WIS); Wiliwilinui Ridge Trail, *Crosby & Anderson 1514* (BISH, GH), *Degener, Greenwell, & Murashige 19708* (WIS); "back of Honolulu," *Rock s.n.* (A); Oahu without specific locality, *Steck s.n.* (BISH).

MOLOKAI: Kaunakakai, along road to Maunahui, *St. John et al. 12629* (BISH); along Puukauwa jeep trail, *Spence 60* (BISH, US); eastern highland, upper Maunahui Camp, *Cranwell, Selling, & Skottsberg 2555* (BISH); head of Waikolu Valley, *Degener & Tousley 22165* (BISH), *Kondo*, 18 June 1962 (BISH); Puu O Kaeha, *St. John et al. 12530* (BISH); Wailua Valley, *St. John et al. 13251* (BISH), *Rock 7073* (GH), Maunaoluolu, *St. John, Baxter, & Williams 19848* (BISH); Kaluaaha, *Rock 7059* (BISH, GH); Punaula Valley, *St. John & Fosberg 12809* (BISH); Kainalu, Pukoo, *Degener & Murashige 20132* (BISH, MO, NY, US, W); west ridge of Honomuni, *St. John 25196* (BISH); Molokai without specific locality, *Hitchcock 15172* (US), *Stokes*, in 1909 (BISH).

LANAI: North of Lanai City, *Degener 22199* (BISH); Hulopoe Gulch, *St. John & Eames 18748* (BISH); Kaiholena, *Forbes 5.L* (BISH); Kapohahu Gulch, *Degener 28679* (A, BISH, NY, W); northwest part of Munro Trail, *Degener & Hobdy 24199* (NY); north end of Munro Trail, *Spence 316* (BISH); Lanaihale, *Degener 28659* (A, BISH, MO, NY, W), *Uluuru 37* (BISH); Kaohai, northwest of Lanihale, *Degener & Degener 30738* (WIS); head of Awehi Gulch, *St. John & Hosaka 18892* (BISH); Lanai without specific locality, *Forbes 249.L* (BISH), 324.L (BISH), *Hitchcock 14658* (US), *Munro 17* (BISH), *Rock 8022* (BISH), *8044* (A, BISH, GH).

MAUI: West Maui: Beginning of Honokahau ditch trail, *Degener, Degener & Fleming 25137* (BISH, NY, US, W); Honokahau Drainage Basin, *Forbes 479.M* (BISH); Makamakole Gulch above Makamakole Stream, *Gagné* 500 (BISH); south of Makamakole Stream, *Degener, Greenwell, & Hatheway 21146* (BISH, NY, US, W, ISOTYPES of *P. hawaiiensis* var. *glabrithyrsa*); Waihee Ridge, *Sohmer 6588* (BISH); southeast ridge of Mt. Alani, *Degener 19610* (NY, US); Puu Kukui, *Herbst*

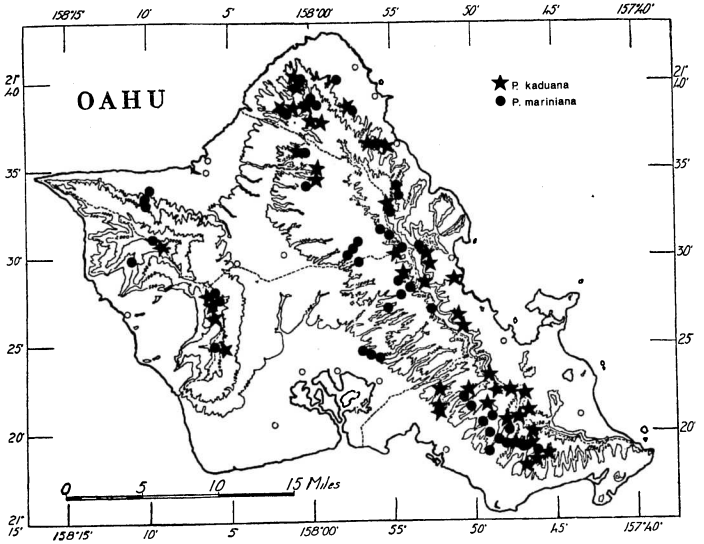


FIGURE 37. Distribution of *Psychotria kaduana* and *P. mariniana* on the island of Oahu.

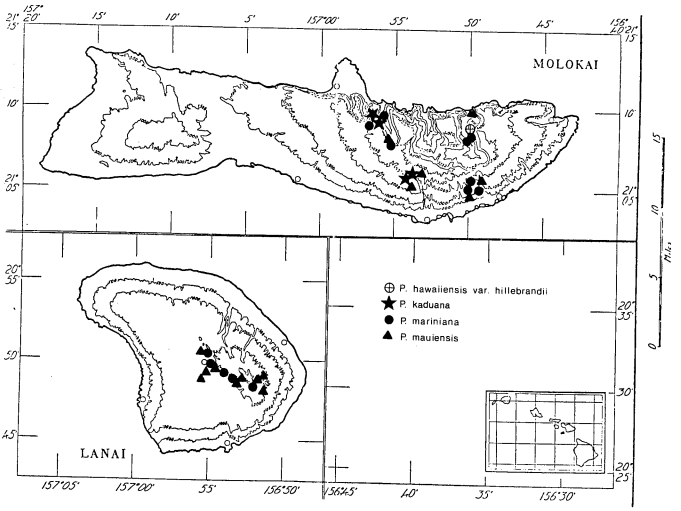


FIGURE 38. Distribution of *Psychotria* taxa on the islands of Molokai and Lanai.

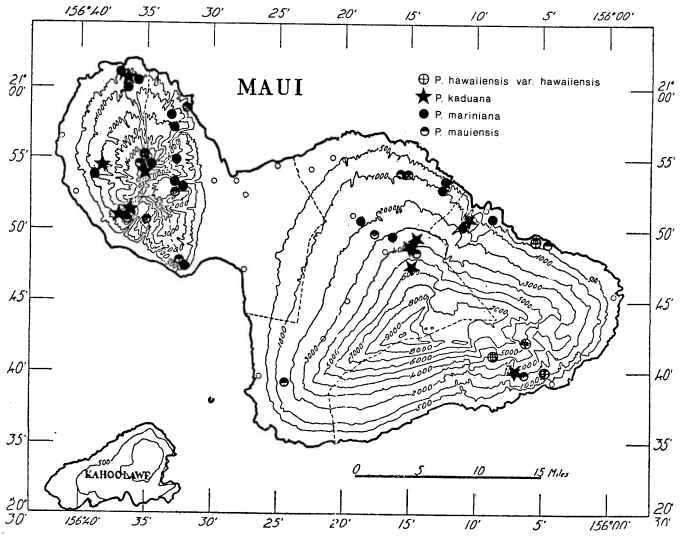


FIGURE 39. Distribution of *Psychotria* on the island of Maui.

& Bishop 1293 (HAW), *Hitchcock 14814* (US); Iao Valley, *Forbes 98.M* (BISH, MIN), in June, 1910 (BISH); Puu Lio, *Degener & Ordonez 12905* (NY); Paupau Ridge, *Degener & Murashige 20029* (NY, US, W); McGreggor, *Degener, Barber, Tain, & Tousley 22094* (BISH); East Maui: Makawão, *Faurie 394* (A); Kailua, *Forbes 2527.M* (US, RSA); east bank of Honomanu Gulch, *Forbes 2566.M* (BISH); Kailua, north slope of Haleakala, *Forbes 2528.M* (BISH, NY, W); Waikamoi, *Rock*, Feb. 1904 (BISH); 20 miles west of Hana, *Henrickson 3725* (RSA); Olinda, Kula Pipe Line Trail, *Skottsberg 852* (BISH), *Rock 8539* (BISH); Kula Pipeline Trail, between Waikamoi and Honomau Stream, *Webster, Gankin, & Herbst 13946* (BISH); Maui, without specific locality, *Curran 65* (US), *Forbes 2307.M* (BISH), *Wawra 1645b* (W).

A variable species, but the majority of its members are distinguished from their nearest relatives by the symmetrical, obovate to oblanceolate, coriaceous leaf blades on well-defined petioles, with revolute margins and conspicuous domatia, and by the small flowers which tend to be glabrous, except for patches of hair found in the throat of the corolla tube of some of them. Some of the representatives of this species have developed the characters mentioned above to a point where they cannot be mistaken for any other taxon of *Psychotria* in the Hawaiian Islands. This is particularly true of the individuals from the high plateau of Kokee and vicinity (FIGURE 40). The difficulties arise with (1) the adaptive radiation and resultant variability shown by this species and others on the younger islands, where the period of tenure has not been as long, probably, as on the older ones, and (2) the introgressive hybridization that appears to occur between nearly all the species of the section *Straussia* to a lesser or greater extent with resultant new combinations of characters. FIGURES 41 – 51 illustrate some of the variation in size and morphology of the flowers and fruit in this species.

7. **Psychotria kaduana** (Chamisso & Schlechtendal) Fosberg in Occas. Pap. Bishop Mus. **23:** 43. 1962, in Brittonia **16:** 265. 1964. FIGURES 24, 37 – 39, 52 – 65.

Coffea kaduana Chamisso & Schlechtendal in Linnaea **4:** 33. 1829; Hook. & Arn. Bot. Beechey Voy. 86. 1841.
Coffea chamissonis Hook. & Arn. Bot. Beechley Voy. 86. 1841.
Straussia kaduana A. Gray in Proc. Amer. Acad. Arts **4:** 43. 1858; Mann in op. cit. **7:** 170. 1867; Wawra in Flora **57:** 321. 1874; Hillebr. Fl. Haw. Isl. 179. 1888; Heller in Minnesota Bot. Stud. **1:** 903. 1897; Rock, Indig. Trees Haw. Isl. 447. 1913; Skottsberg in Acta Horti Gothob. **10:** 181. 1935, in op. cit. **15:** 469. 1944.
Straussia kaduana var. *coriacea* Hillebr. Fl. Haw. Isl. 179. 1888.
Straussia kaduana var. γ Hillebr. Fl. Haw. Isl. 179. 1888.
Straussia leptocarpa Hillebr. Fl. Haw. Isl. 180, p.p. 1888.
Straussia pubiflora Heller in Minnesota Bot. Stud. **1:** 905. *pl. 62.* 1897.
Straussia longissima Rock, Indig. Trees Haw. Isl. 447. 1913.
Psychotria kaduana var. *longissima* Fosberg in Brittonia **16:** 266. 1964.
Psychotria kaduana var. *pubiflora* Fosberg in Brittonia **16:** 265. 1964.
Psychotria leptocarpa Fosberg in Brittonia **16:** 266. 1964.

Trees to 8 m. tall, with grayish, yellowish, or dark brown twigs 2 – 5 mm. wide below the apex, the stipules broadly obovate, to 8 mm. long; leaves nearly sessile or with petioles to 2.5 cm. long, and membranaceous, chartaceous or coriaceous, obovate to oblanceolate blades 0.9 × 2.5 – 6 × 14.5

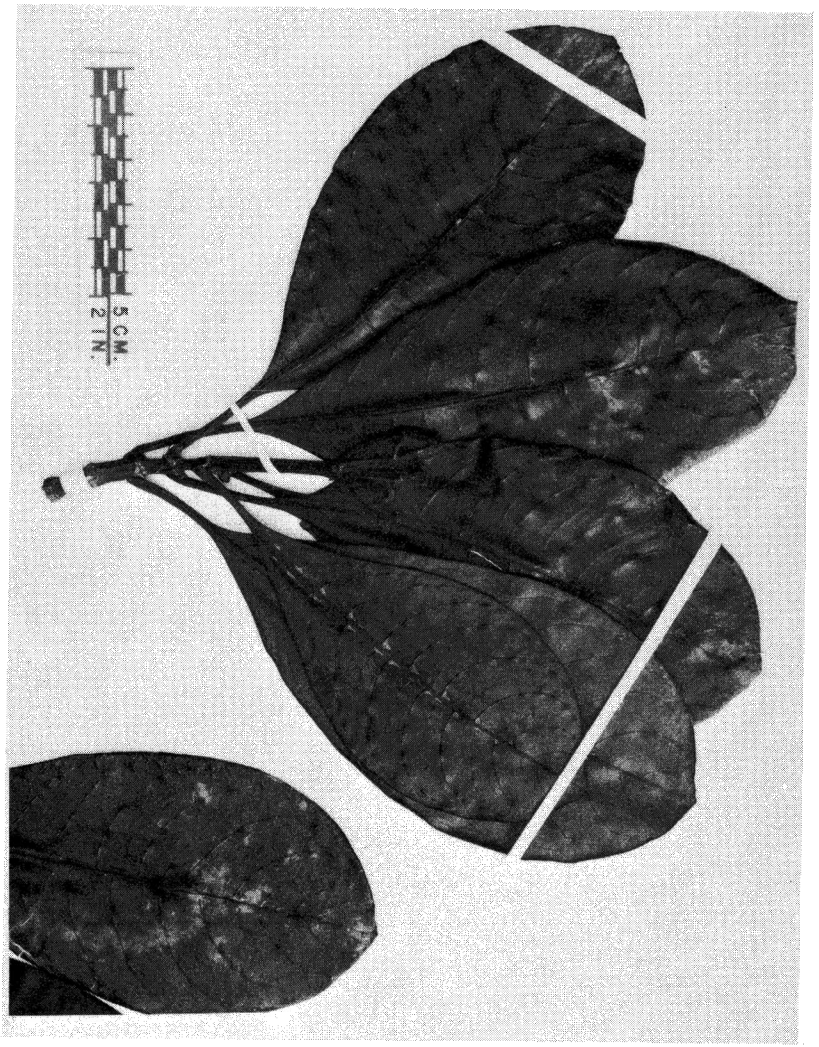
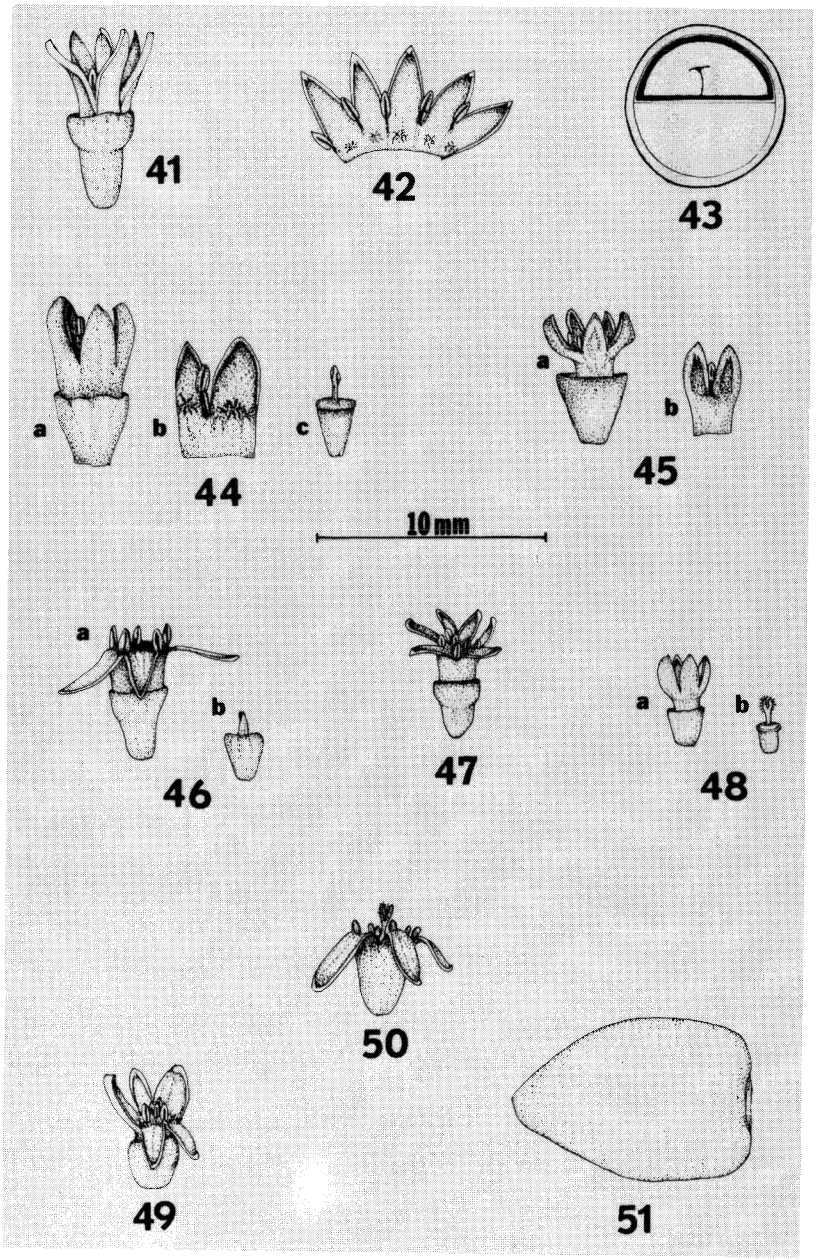


FIGURE 40. *Psychotria mariniana* (Chamisso & Schlechtendal) Fosberg, from *Rock*, in Feb. 1956 (BISH); note strong venation, large domatia, rather stiff coriaceous leaves with blades tapered at the base to a firm and long petiole; the peduncle is relatively very thick and stiff; these features are found in most of the individuals of this species from the Kokee area on Kauai.

cm. wide and long, these mostly glabrous but sometimes puberulent beneath, at base obtuse, cuneate, acute, or acuminate, infrequently attenuate, rarely rounded, at apex rounded, obtuse, or acute, often with an abrupt, short, but wide point, with small domatia less than 0.5 mm. infrequently present in the axils of the 6 – 14 lateral veins to a side, these sometimes with the tertiary veins forming a conspicuous network, the marginal ribs moderately, weakly, or not at all developed; inflorescence with one main axis with 2 or 3 nodes with verticillate branching, the peduncle 0.6 – 1.5 mm. wide and 0.2 – 15.5 (usually 1.6 – 6.5) cm. long, often pendent, at least in fruit, with the branches 0.3 – 5.5 mm. long and often branched again, the ultimate branches terminating in cymules of 3 flowers, all branches subtended by short bracts, these wider than long and early caducous; flowers 4-, 5-, and sometimes 6-merous, functionally staminate or pistillate; calyx 1.5 – 2 mm. long at anthesis (including hypanthium), slightly expanded or, infrequently, flared toward the top, the apex truncate or with very shallow lobes, usually glabrous, infrequently pubescent; corolla at anthesis with tube about 1.5 mm. long, usually glabrous, but sometimes pubescent at throat, the lobes ovate to nearly subulate, 1 – 3 mm. long, usually relatively thin; stamens (of the staminate flowers) with filaments about 1 mm. long at anthesis, affixed to the base of the ovate-oblong 0.8 – 1.2 mm. long anthers (staminodes produced in the pistillate flowers); pistil (of functionally pistillate flowers) with ovaries (including terminal disc) top-shaped and 1.5 – 2 mm. long, the style 1.5 – 3 mm. long, the stigmas divaricate, often pubescent, about 1 mm. long (appressed and smaller in the staminate flowers); fruit pyriform or ellipsoid, 5 – 15 mm. long, often with a disc protruding prominently from within the remnants of the calyx; pyrenes semicircular in cross section with a "T"-shaped invagination of the seed coat on the ventral surface.

TYPIFICATION AND NOMENCLATURE: The original type specimen was collected on the island of Oahu and had been on deposit in Leningrad. It shared the same fate as the holotype of *Psychotria mariniana*, discussed above; it has presumably not been seen since Dr. Fosberg left it in care of the Russian Embassy after the Second World War. I have designated, therefore, a neotype specimen which I hope will be supplanted eventually by the recovery of the holotype. The specimen I herein designate as neotype is *Christophersen & Hume 1426* (BISH). It is shown in FIGURE 52. This specimen best fits Dr. Fosberg's recollection of the holotype. It was collected at 500 – 700 m. on Kahuauli Ridge.

FIGURES 41 – 51. Variation in flower and fruit morphology in *Psychotria mariniana*: 41, flower at the beginning of anthesis, from *Fosberg 29789* (BISH); 42, detail of corolla of staminate flower, from *Grant 7084* (BISH); 43, cross section of mature fruit, from *Forbes 317.K* (BISH); 44, from *Bryan, Suehiro, & Fukuda s.n.* (BISH), staminate flower (a), portion of corolla (b), and detail of pistil (c); 45, from *Russ s.n.* (BISH), pistillate flower (a) and portion of corolla (b); 46, from *Henrickson 4046* (BISH), staminate flower (a) with pistil (b); 47, hexandrous flower, from *Forbes 2528.M* (BISH); 48, pistillate flower, from *Rock 7059* (BISH); 49, staminate flower, from *Degener 22199* (BISH); 50, pistillate flower, from *Skottsberg 966* (BISH); 51, mature fruit, from *Degener, Greenwell, & Hatheway 21146* (BISH).


41
42
43
a
b
c
44
a
b
45
10 mm
a
b
46
47
a
b
48
50
49
51

The reason this taxon has acquired so many names, as evidenced by the list of synonyms, is probably due to the fact that it is one of the inherently most variable taxa in section *Straussia*. We have here, aside from the expected introgression ahd hybridization, a phenetically extremely plastic taxon of relatively wide ecological amplitude and distribution. Looked at in a piecemeal fashion, as most previous authors have had to do, the tendency has been to name and describe each outstanding variation as a new taxon. The opportunity to study this taxon thoroughly and within the context of the entire section has enabled me to see that these phenetic variations are all connected one to the other by intergrading forms which make it impossible to maintain these taxa as distinct entities from a taxonomic standpoint. Trying to do so makes any kind of rational approach to studying the group confusing to professionals and amateurs alike. *Psychotria kaduana*, therefore, must be treated as a large, extremely polymorphic taxon with a large number of intrinsic variations. In the paragraphs below I will discuss the taxa, and their type specimens, which are being reduced to synonymy.

Hillebrand's varieties *coriacea* and γ doubtless belong here. The original Hillebrand specimens for these taxa are no longer extant, having been lost in Berlin during the Second World War. The type specimen for var. *coriacea* came from Kalihi, and Hillebrand lists two localities for his var. γ: Pauoa and Makiki. The localities and descriptions Hillebrand provided leave little room to doubt that these specimens did indeed represent variants of *Psychotria kaduana*, although I would not venture as far as Fosberg to state, as he did, that Hillebrand's description for var. *coriacea* possibly described a hybrid between *P. kaduana* and *P. mariniana*. If hybridization could be gleaned from this description it would, in my opinion, tend more to implicate *P. fauriei*, and not *P. mariniana*, as the other parent.

Hooker and Arnott's specimen of their *Coffea chamissonis*, which was collected during Beechey's Voyage, has also not been found. It differed, according to the authors, but little from *Coffea kaduana*, the younger leaves being glabrous and the reddish pubescence absent from leaf scars and bracteoles.

Hillebrand's *Straussia leptocarpa* was described from a specimen collected in Pumelei, East Maui *(Hillebrand s.n.)*, for which there is fragmentary material deposited at BISH. I have designated this specimen, which was labeled as *Straussia leptocarpa*, perhaps in Hillebrand's own hand, as lectotype. The holotype doubtless suffered the same fate as did most of the other Hillebrand material in Berlin. Apparently the characteristic that must have drawn Hillebrand's attention to the specimen, judging from the description, was the fact that the disc of the ovary was very prominent and projected through the persistent calyx tube in fruit. This is another characteristic that appears here and there throughout the range of *Psychotria kaduana*, as well as other taxa in section *Straussia*, with the usual intergrading forms which,

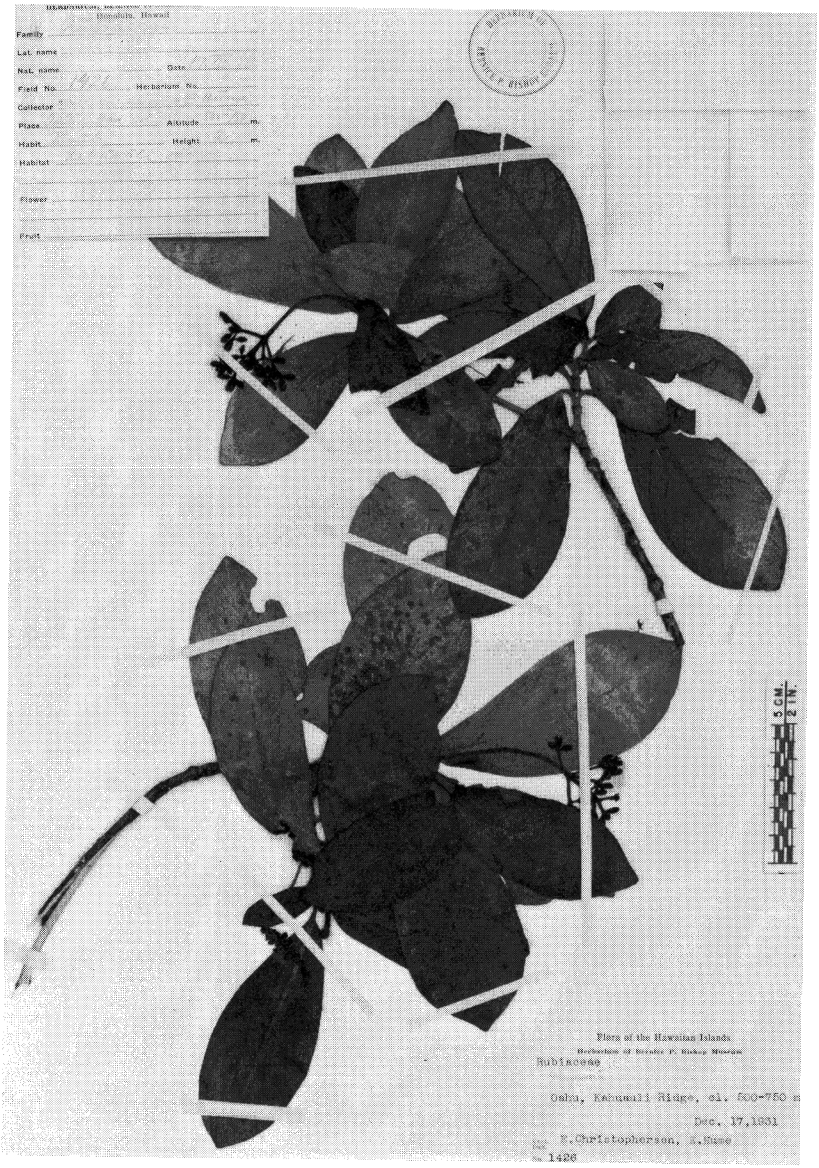
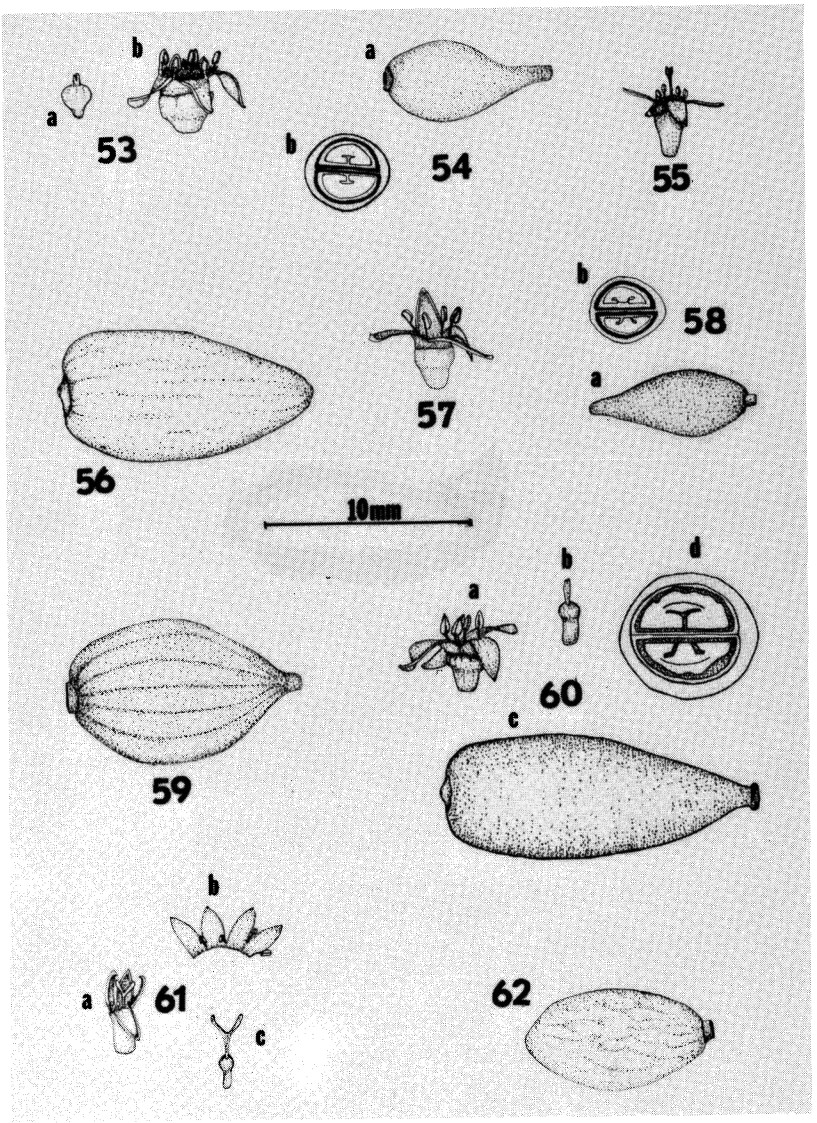


FIGURE 52. *Psychotria kaduana* (Chamisso & Schlechtendal) Fosberg, from *Christophersen & Hume 1426* (BISH, NEOTYPE).


a
b
53
a
b
54
55
b
58
a
57
56
10mm
b
d
a
60
c
59
b
a
61
c
62

with an overview of the entire species, make it impossible to separate those populations in which this characteristic is pronounced. FIGURE 64 shows an example of this type of variation.

Rock's *Straussia longissima* is another good example of a particularly outstanding variant in this taxon for which there are intergrading forms connecting it to the more usual type. Rock's taxon is based on those individuals in one or two populations that had much longer than average peduncles. The type collection, *Rock 10200*, was made in Nuuanu Valley. The holotype is at BISH and there are isotypes at GH (FIGURE 63) and US.

The type collection for Heller's *Straussia pubiflora* is *Heller 2300*. The holotype, or at least a specimen identified as such, is at US, and there are isotypes at A, BISH, F, GH, MO, and NY. The collection was made on the lower slopes of Konahuanui. Heller was specific as to how this taxon differed from *Psychotria kaduana*. From the description, as well as the name, one would gather that the specimen was a bit more puberulent, particularly on the inflorescence, than *P. kaduana*, as Heller would have understood it. Again, from the examination of a few specimens, all of which differed somewhat one from the other, it was easy, and at that time logical, to name these variations. Heller compared his species to Hillebrand's *Straussia kaduana* var. γ and considered those to be representative of the same taxon. Fosberg also considered Heller's species, which he reduced to the rank of variety when he transferred it to *Psychotria*, to be "merely a form of *P. kaduana*, with the under sides of the leaves, the thyrses, and inner faces of the corolla lobes sparsely pilosulous or hirtellous..."

DISTRIBUTION: This species is the most widely distributed Hawaiian species of *Psychotria*, being found on the islands of Kauai, Oahu, Molokai, and Maui (FIGURES 24, 37–39). Why it is also not on Lanai is inexplicable. Flowering specimens have been collected throughout much of the year. There appear to be peak flowering periods, and on Oahu this is in the spring and early summer. On Kauai this peak flowering appears to occur in the fall.

KAUAI: Hanakapiai, *St. John 10977* (BISH), *St. John, Britten, & Frederick 23172* (BISH, NY); Waiahuakua Valley, along Kalalau Trail, *Fay 416* (PTBG); Waimea, Alakai Swamp Trail, Hulepakuhi, *Chock & Cliff 1142* (BISH); Ka Loko Reservoir, *Forbes 578.K* (BISH); Wainiha Valley, *Stone 1485* (BISH), *Woolford 386* (BISH), *387* (BISH); east slopes of Makaleha Mt., tributary of Makaleha Stream, above Kapoa, *Fay 512* (PTBG, UWL); Hii Mts., *Forbes 632.K*

FIGURES 53–62. Variation in flower and fruit morphology in *Psychotria kaduana*: 53, from *Forbes 578.K* (BISH), staminate flower (b) with detail of pistil (a); 54, from *Hosaka 1286* (BISH), mature fruit (a) with cross section (b); 55, pistillate flower, from *Mann & Brigham 75* (BISH); 56, mature fruit, from *Ewart 16* (BISH); 57, staminate flower, from *Christophersen & Hume 1426* (BISH, NEOTYPE); 58, from *St. John 12281* (BISH), mature fruit (a) with cross section (b); 59, mature fruit, from *Forbes 1850.0* (BISH); 60, from *Kuykendal 27* (BISH), staminate and 4-merous flower (a), with detail of pistil (b), and fruit (c) and cross section (d); 61, from *Lyon s.n.* (BISH), pistillate flower (a) with corolla split and laid flat (b) and detail of pistil (c); 62, mature fruit, from *Forbes 53.M* (BISH).

FIGURE 63. *Psychotria kaduana* (Chamisso & Schlechtendal) Fosberg, from *Rock 10200* (GH); an example of the long-peduncled variation of this species.

(BISH); Haupu Range, Kipu, *Forbes 750.K* (BISH), *St. John & Fosberg 13626* (BISH), *13653* (BISH); east of Koloa, *Stone 1627* (BISH).

OAHU: Waianae Mts.: Puu Kaala, *Kerr*, 3 Mar. 1946 (BISH); Kaluaa Ridge between Puu Kanehoa and Puu Hapapa, *Bishop s.n.* (BISH); Puu Hapapa, *Degener 17746* (NY); Puu Kanehoa, *St. John 11054* (BISH), *Stone 3444* (BISH); Kunia Trail, east of Puu Kanehoa, *Stone 3320* (BISH); Puu Kaua, *St. John 12194* (BISH); Kaaikukae, *Russ*, in Oct. 1929 (BISH); Koolau Mts.: Oio – Paumalu Trail, *Degener 13011* (BISH, NY), *13012* (BISH, NY, US); Kaunala Gulch, *St. John & Hosaka 20137* (BISH); Pupukea – Malaekahana Trail, *Skottsberg 1813* (BISH); Waimea – Malaekahana Trail, *Ozaki 397* (HAW); Pupukea, *Stone 2793* (BISH), *3653* (BISH); Pupukea – Kahuku trail, *Degener & Carrol 20557* (NY), *Degener & Hatheway 20727* (NY, US), *Lamoureux 482* (HAW), *Pearsall 524* (BISH), *Suehiro*, 6 Mar. 1932 (BISH); Waimanu Ridge, *Forbes 1988.0* (BISH); ridge north of Waimea Valley, *Forbes 2043.0* (BISH), *2049.0* (BISH); Kawailoa trail, *Hartt*, 31 Oct. 1937 (BISH); first side gulch north of mouth of Kawainui, *Welch & Yamaguchi*, in Jan. 1936 (BISH); Kawaiiki, *Degener, Hatheway, & Silva 20862* (BISH, US), *Gillett 1427* (HAW); Paalaa, south Opaeula Gulch, *Hosaka 331* (BISH), *St. John 10614* (US); Ihiihi – Kehawainui, *Welch*, 10 Apr. 1935 (BISH); Hauula, Maakua – Papali Ridge, *Meir*, 15 Oct. 1933 (BISH); east ridge of Kaipapau Valley, *Degener & Park 11494* (NY); Hauula, north slope of Papale Gulch, *Degener 12917* (NY, US), *12918* (BISH, NY); Punaluu, *Meebold*, in May, 1932 (BISH), *Rock*, in 1908 (BISH), *161* (GH); Waikane, *Rock 1281* (GH); ridge, south side of Kahana Valley, *Degener & Silva 21073* (NY, US, W); ridge between Waiahole and Waikane Valleys, *Harris C242054* (BISH, NY, MIN); Waikane – Schofield Trail, *Gupta 22* (HAW), *Yuncker 3198* (US), *3199* (US); Haiku Valley, *St. John 12281* (BISH), *12282* (BISH); Moanalua Ridge, *Marks*, 20 Aug. 1944 (WIS), 30 Oct. 1944 (WIS); Kahaluu, north ridge, *Hosaka 1286* (BISH); Kipapa Gulch, *Hosaka 856* (BISH), *1204* (BISH); Kipapa Gulch, south ridge, *Hosaka 1082* (BISH), *1083* (BISH), *1102* (BISH); Waiolani Ridge, *Forbes 1850.0* (BISH); Kalauao – Halawa Ridge, *Lamoureux 161* (HAW); Kahuauli Ridge, *Christophersen & Hume 1426* (BISH, NEOTYPE); Kalihi Valley, *Christophersen, Wilder, & Hume 1486* (BISH), *Degener, Greenwell, Murashige, & Kerr 19653* (MO, NY, US), *Faurie 406* (A), *Forbes s.n.* (BISH), *Heller 2333* (F, GH, MO, NY, US), *Hitchcock 14097* (US); Kalihi Pali, *Christophersen 1274* (BISH); Lanihuli Trail, *Forbes & Stokes*, 28 June, 1908 (BISH), *Forbes*, 17 Sept. 1908 (MO), *Forbes*, 10 Dec. 1908 (BISH), *Forbes 1472.0* (BISH); main ridge southwest of Puu Lanihuli, *Herbst & Bishop 1262* (HAW), *St. John 11194* (BISH); Nuuanu – Kalihi Ridge, *Skottsberg 143* (BISH); Nuuanu Valley, *Forbes s.n.* (MO), *1047.0* (BISH), *Rock 10200* (BISH, HOLOTYPE of *Straussia longissima* GH, US, RSA, ISOTYPES); Nuuanu Pali, *Faurie 396* (A), *Heller 2193* (A, BISH, GH, MO, NY), *Hitchcock 13764* (US), *14052* (US), *Stone 2783* (BISH), below the Pali on the windward side, *Harris C242018* (BISH, MIN); Konahuanui, *Christophersen, Wilder, & Hume 1733* (BISH), *Faurie 405* (A), *Forbes*, 28 July, 1908 (BISH), *Gosline 4S* (HAW), *Heller 2193* (MIN, US), *2210* (A, F, GH, MO, US), *2300* (US, HOLOTYPE of *Straussia pubiflora* (A, BISH, F, GH, MIN, MO, NY, ISOTYPES), *2350* (F, NY, US); Palolo Ridge, above crater, *Lyon 1182* (A, BISH), *1199* (BISH); Palolo Valley, *Lyon*, 16 Aug. 1908 (A), *St. John*, 7 Mar. 1908 (BISH), *Skottsberg 896* (BISH); Palolo Valley, Kaau Crater, *Garber 394* (BISH), *Herbst & Bishop 976* (HAW), *Kuykendall 27* (BISH), *St. John 20293* (BISH, RSA), *Stone 3491* (BISH); Manoa – Palolo Ridge, *Krauss*, 10 Jan. 1933 (BISH); Manoa – Palolo Trail, *Young 96* (HAW); Kapalama – Waolani Ridge, *Ewart 12* (BISH), *16* (BISH); Mt. Tantalus, *Lamoureux 647* (HAW); Manoa Cliff Trail, *Arneman*, 29 Mar. 1942 (BISH), *Beardsley s.n.* (BISH), *Crosby & Anderson 1730* (BISH, GH), *Degener & Martinez 11491* (GH, MO, NY, US, WIS), *Degener & Shigeura 11493* (NY, US), *Forbes 2483.0* (BISH), *2484.0* (BISH), *2485.0* (BISH), *Fosberg 41459* (US), *Garber 215* (BISH), *Gill*, in July, 1961 (BISH), *Hillebrand s.n.* (US), *Kuykendall 65* (BISH), *Lyon*, 5 Sept. 1909 (A), *Nagata 42* (HAW), *Pearsall*, 31 July, 1949 (BISH), *Rogers*, 21 July, 1946 (NY), *St. John 9881* (A, NY), *Thorne 33381* (GH), *Werny 32* (HAW); Waahila Trail, near summit, *Carlquist 1622* (RSA), *Herat & Herat 346* (BISH), *Herbst & Bishop 1277* (HAW); central ridge of Wailupe Valley, *Hatheway & Miller 511* (US); "Honolulu," *Anderson*, in 1852 (BISH); Wilhelmina Rise, *Hatheway*, 3 Nov. 1949 (US), *144* (US); Waialae Nui, *Degener & Nihei 20227* (WIS), *20229* (MIN, NY, US); Wiliwilinui Ridge, *Cowan 591* (F, W), *Degener, Greenwell, & Murashige 19715* (NY, US), *Ochikubo 89* (HAW); Koolau Mts. without specific locality, *Kelly 146* (A); Oahu without specific locality, *Endlicher s.n.* (W), *Hillebrand 229* (GH), *Mann & Brigham 75* (BISH, F, GH, MO, US), *567* (F, NY), *Meyen*, in May 1831 (W), *Remy*, in 1851 – 1855 (P), *320* (P), *321* (P), *325* (P), *327* (F, GH), *Seemann 2283* (GH), *Wawra 1645* (W), *Wilder*, in 1913 (BISH), *U.S. Expl. Exped.* (NY, US).

FIGURE 64. *Psychotria kaduana* (Chamisso & Schlechtendal) Fosberg, from *St. John 12281* (BISH); an example of the variation in this species exhibiting a pronounced disc protruding from the calyx tube on the mature fruit.

MOLOKAI: Waialea, *Rock*, in Feb. 1920 (A); Wailau Valley, *Forbes 546.Mo* (BISH); Kukuinui Ridge, *St. John, Dunn, & Storey 13306* (BISH); head of Waikolu Valley, *Degener & Tousley 22165* (NY); mts. above Puu Kolekole, *Forbes 138.Mo* (BISH), *171.Mo* (BISH, RSA); Pupeo ridge, *Forbes 412.Mo* (NY).

MAUI: West Maui: Honokahau Drainage Basin, *Forbes 427.M* (BISH), Hanakaoo (?), *Forbes 53.M* (BISH); Paunau, Kahoma Stream above intake, *St. John, Catto, & Coulter 17679* (BISH); Puu Kukui, *Wilbur & Webster 887* (BISH), *889* (NY); Olowalu Valley, central ridge, *Forbes 2343.M* (BISH), lateral ridge, *Forbes 2293.M* (BISH); Haelaau, *Ewart*, 19 Dec. 1928 (BISH); Maunahooma (?), *Forbes & Cook 19.M* (BISH), *32.M* (BISH); East Maui: Kailua, north slope of Haleakala, *Forbes 2528.M* (NY, RSA); Papaoea, *Forbes 2524.M* (BISH); Halehalu Ridge, *Forbes 2534.M* (BISH); trail up west bank of Honomanu, *Forbes 2601.M* (BISH); Waikamoi, between forest reserve gate and road to the lower flume of the Kula Pipeline Trail, *Crosby & Anderson 1828* (BISH); Kula Pipeline Trail, *Forbes 1278.M* (BISH); Pumelei, *Hillebrand s.n.* (BISH, LECTOTYPE of *Straussia leptocarpa*); Kipahulu, summit of west ridge of Kaukana Gulch, *St. John & Gatto 17822* (BISH); Haleakala, without specific locality, *Forbes 2536.M* (BISH, NY); Maui without specific or certain locality, *Curran 87* (NY, US), *Forbes*, in Nov. – Dec. 1919 (BISH), *Lyon*, 20 Nov. 1908 (BISH).

HAWAIIAN ISLANDS, without specific locality: Collector Unknown (W), *Gaudichaud*, in Sept. – Oct. 1836 (P), *Hillebrand s.n.* (BISH, US), *226* (GH), *233* (GH), *17614* (?) (GH), *Kelly*, in July, 1916 (A), *Mann & Brigham 282* (BISH), *299* (BISH), *414* (GH), *703* (BISH), *714* (BISH), *Rock s.n.* (BISH), *U.S. Expl. Exped.* (GH, NY), *Wawra 2382* (W), *Wilder*, in 1913 (BISH).

As mentioned, this species is one of the most variable in the Hawaiian Islands. The individuals which are closest to the original concept of Chamisso & Schlechtendal are from the southern Koolaus, Oahu. The Koolau Range today is the center of abundance and diversity in the species, and may be the place in which the species has differentiated. Many of the individuals cited from Kauai, and even from the Waianae Mountains, Oahu, appear questionable at first, particularly when compared with the neotype. The distance among such specimens is bridged, however, when viewing a large number of specimens from throughout the species range. I consider the hypothesis likely that the individuals on Kauai, if not the result of earlier dispersal from Oahu, represent the source from which the Oahu representatives were derived. FIGURES 53 – 62 illustrate some of the variation in size and morphology of the flowers and fruit of this species. FIGURES 63 – 65 illustrate some of the extreme variations exhibited by certain populations, variation bridged thoroughly by intermediate forms.

PSYCHOTRIA KADUANA × P. MARINIANA INTROGRESSIONS

In the past, the main difficulty with the last two species discussed has been, and remains still, that a number of individuals, mostly from the southern Koolaus, cannot be comfortably assigned to *Psychotria kaduana*. These individuals possess one or more features that are associated more with *P. mariniana*. Examination of these specimens and simple quantitative analysis of them have led me to agree with previous workers that at least some of this variation has been due to introgressive hybridization. Most of the hybridizations seem to have occurred in the southern Koolaus, even taking into account the larger numbers of collections that have generally

FIGURE 65. *Psychotria kaduana* (Chamisso & Schlechtendal) Fosberg, from *Heller 2193* (GH); a small-leaved variation of this species which resembles closely elements of *P. mauiensis*.

been gathered in that region, due to its accessibility from Honolulu. The situation is probably not unlike that recorded for two species of *Charpentiera* by Sohmer (1972), in which case there were apparently no barriers to hybridization between *Charpentiera elliptica* and *C. densiflora*, both of which occur on Kauai, but which were kept distinct by different ecological preferences.

It is quite often a relatively subjective process to relegate a particular specimen to either one taxon or the other. When this is not possible, I formally recognize the intermediate position of the individuals represented by the specimens examined. These specimens are cited below for the value they may have for future workers.

OAHU: Waianae Mts.: Kunia Trail, *Stone 3318* (BISH); Mauna Kapu – Palikea, trail near base of steep incline, *Nagata 862* (BISH); Mauna Kapu – Palikea, cliffs at head of Nanakuli Valley, *Fosberg 29783* (BISH); Kaaikukai, *Russ*, in July 1929 (BISH); Koolau Mts.: Oio – Paumalu Trail, *Degener 13010* (BISH); road between Kahuku and Pupukea, *Yamada 30* (HAW); Kopiko, Kawaiiki Ditch Trail, *Woolford 11* (BISH); ridge south of S. Opaeula Gulch, *St. John 11520* (BISH); Hauula, Waipilopilo, *Degener 13006* (BISH, NY); Puu Peahinaia, Paaka – Kawailoa Divide, *St. John 11118* (BISH); Punaluu, *Meebold s.n.* (BISH), *Rock 166* (BISH); ridge between Kahana and Wahiawa Valleys, *Harris C242171* (MIN); Wahiawa, *Rock*, 2 Aug. 1908 (BISH); Waimano Trail, *Bryan 1542* (BISH); Kipapa Gulch, *Hosaka 571* (BISH), *1076* (BISH); Lanihuli Trail, *Forbes 1477.0* (BISH, MO); Konahuanui, *Christophersen, Wilder & Hume 1726* (BISH); trail from Pauoa Flats to Puu Konahuanui, *Crosby & Anderson 1351* (BISH, GH); Manoa Cliff Trail, *Carlquist 1711a* (RSA), *Fosberg 41461* (BISH, US), *Gillett 1367* (BISH, HAW), *Kuykendall 184* (BISH), *Pearsall 223* (BISH), *Rassell 109* (BISH), *Swezey*, 18 Nov. 1934 (BISH), *Wong 27* (US); Waahila Ridge, *Gupta 52* (HAW); back of Tantalus, *Skottsberg 75* (BISH); ridge between Palolo and Waialae Iki, *Forbes 2410* (BISH); Palolo Valley, *Stone 3501* (BISH); ridge toward Palolo from Manoa, *Meebold*, in June 1932 (BISH); ridge west of Waialae Valley, *Forbes 1950* (BISH); Kuliouou, *Christophersen, Wilder, & Hume 1527* (BISH), *1531* (A, BISH).

I suspect that for at least some of these specimens cited as representing introgressions between *Psychotria kaduana* and *P. mariniana*, such designation is merely a useful way in which to deal with the variation presented and the only practical way of treating it taxonomically. Some of this variation is probably the result of the adaptive radiation into new habitats by elements of a highly variable taxon, and may not represent the immediate results of introgressive hybridization at all.

8. **Psychotria hathewayi** Fosberg in Brittonia **16:** 267. 1964.

Psychotria waianensis Fosberg in Brittonia **16:** 268. 1964.

Small trees to 8 m., with yellowish to grayish brown branchlets and obovate or deltoid-obovate stipules to 6 mm. long; leaves either sessile or with petioles 0.1 – 1.2 cm. long and obovate, oblanceolate, elliptic-oblong, or, infrequently, rotund blades 1.1 × 2 – 7.3 × 12.6 cm. wide and long, these acute to truncate or rounded at base, obtuse to rounded at apex, glabrous or infrequently puberulent or hirtellous, particularly along venation, usually without domatia in the axils of the 5 – 11 lateral veins per side, the tertiary veins often forming conspicuous networks; inflorescence sessile or with a peduncle to 5 cm. long, with 1 or 2 nodes with verticillate branching at each,

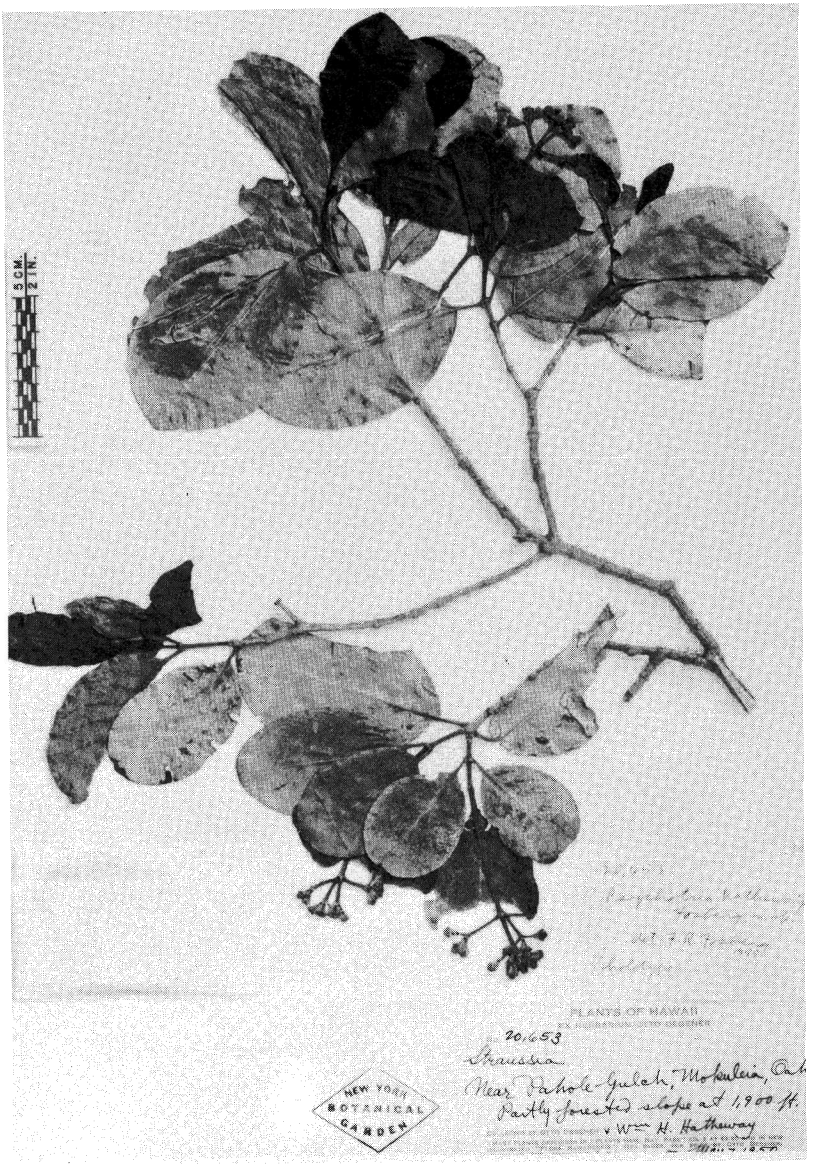


FIGURE 66. *Psychotria hathewayi* var. *hathewayi*, from *Degener & Hatheway 20653* (NY, HOLOTYPE).

the branches to 1.8 cm. long, always shorter on the upper node, each branch usually terminated by a cymule of 3 flowers with the lateral flowers of each cymule with small pedicels and the central one sessile; flowers either pistillate or staminate, 4- or 5-merous; calyx 3 – 3.5 mm. long (including hypanthium), hirsute, often densely so, with long, white hairs, truncate at the apex or with acute lobes; corolla with tube 2 – 3 mm. long at anthesis, somewhat expanded toward the top, glabrous at the throat and smaller than the ovate, usually thick and fleshy lobes, these 3 – 5 mm. long and often hirsute at the tip and along the dorsal or outer surface; stamens (of the staminate flowers) with filaments 1 – 2 mm. long, affixed to the base of the elliptic-oblong or ovate-oblong 0.7 – 1 mm. long anthers; pistil (in the pistillate flowers) with ovary 2 – 2.5 mm. long at anthesis, the style 2 – 3 mm. long, the stigmas divaricate, 0.7 – 1.1 mm. long and often hirsute or pubescent; fruit ellipsoid-pyriform, 12 – 18 mm. long at maturity with a wide but short and persistent calyx through which, sometimes, the persistent and expanded disc of the ovary protrudes; pyrenes semicircular in cross section and with a "T"-shaped invagination of the seed coat on the ventral side.

This species is well set apart from anything else on the island of Oahu by the pubescent calyx and corolla lobes (FIGURES 67 – 80). The flowers tend to be larger than those of the other species in the section save *Psychotria psychotrioides*. These features plus the general tendency of the leaves to be elliptic in broad outline help distinguish it from other taxa. *Psychotria hathewayi* is found in the Waianae Mts. of Oahu, to which it is endemic (FIGURE 9). It occurs in two varieties, as pointed out by Fosberg in 1964.

KEY TO VARIETIES OF PSYCHOTRIA HATHEWAYI

Petioles usually over 5 mm. long; inflorescence with peduncle over 10 mm. long. ..... 8a. var. *hathewayi*

Petioles usually less than 5 mm. long or absent, and/or inflorescence without a peduncle and contracted into a compact, nearly globose arrangement ..... 8b. var. *brevipetiolata*

8a. **Psychotria hathewayi** var. **hathewayi**; Fosberg in Brittonia **16:** 267. 1964. FIGURES 9, 66 – 72, 74 – 75, 77 – 78, 80.

Leaves with petioles 0.4 – 1.2 cm. long and obovate to elliptic-oblong to subrotund blades 1.1 × 2 – 5.5 × 9.5 cm. wide and long, these acute, obtuse, or subcordate at base, rounded to obtuse at apex, glabrous to hirtellous below, without domatia or with very small, inconspicuous domatia in the axils of the 5 – 9 lateral veins per side; inflorescence with peduncles 5 – 50 mm. long; flowers with calyces pubescent, almost never glabrous; corolla lobes also frequently pubescent, particularly at the tips.

TYPIFICATION: The type collection for this species designated by Fosberg is *Degener & Hatheway 20653*. The holotype is at NY (FIGURE 66), and there are isotypes at BISH and US. The collection was made near Pahole Gulch in Mokuleia, Oahu. Fosberg placed great emphasis on the thickened calyx lobes and pubescent inflorescences and corollas. Indeed, those individuals

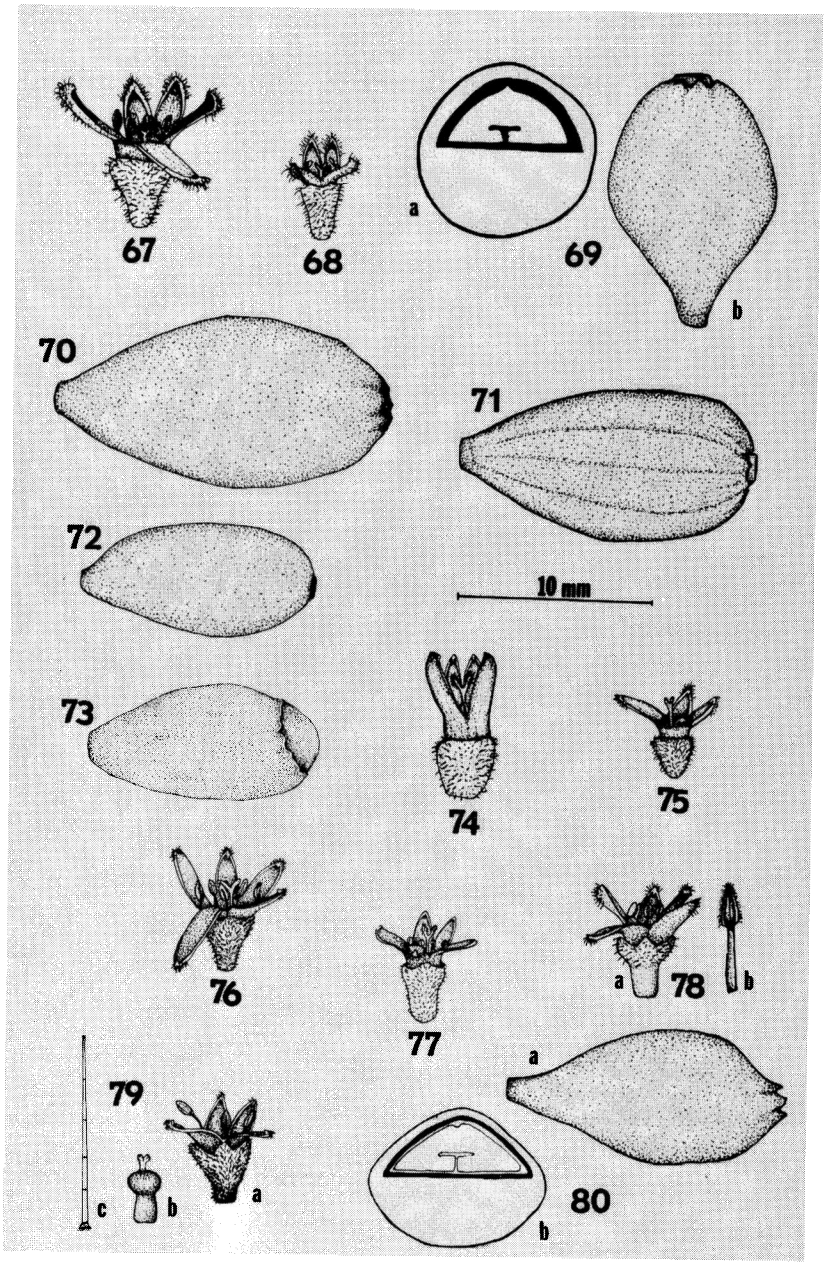
which demonstrate pubescent calyces and corolla lobes are clearly recognizable and distinct, but the characteristic of thickened calyx lobes tends to vary greatly.

The taxon described by Fosberg as *Psychotria waianensis* definitely belongs here. The type collection is *Degener, Greenwell & Hatheway 20686* (NY, HOLOTYPE; BISH, ISOTYPE). It was obtained in the east branch of East Makaleha Valley, Oahu. This specimen, as well as the others cited for this taxon by Fosberg which I have been able to examine, are representative of pistillate individuals and have somewhat smaller leaves than average. Fosberg states that "in superficial appearance *P. waianensis* may resemble small-leafed plants of *P. hathewayi*, but the small corollas without incrassate lobes distinguish it at once." The difference here, again, is one of floral dimorphism related to the sexual differentiation between individuals within this taxon. The pistillate individuals have smaller flowers, on the average, than the staminate individuals.

DISTRIBUTION: Normally found at higher elevations throughout the Waianaes, to which it is endemic, apparently prospering in dryer forests than most of its congeners on the island of Oahu. In fact, as Fosberg (1964) implies, *Psychotria fauriei* in the wetter Koolau Mts. Flowering specimens have been gathered in April and May and fruit appear to mature in August and September.

OAHU: Waianae Mts.: Manini Valley, *Swezey*, 25 Sept. 1934 (BISH); Kawaihapai, southeast of missile station, *Degener, Degener & Cadenhead 27981* (MIN, MO, NY, US, W, WIS); Mokuleia Forest Reserve, head of Kukuiala, *St. John 14076* (BISH), near Pahole Gulch, *Degener & Hatheway 20653* (NY, HOLOTYPE; BISH, US, W, ISOTYPES); Kaawa – Kamokumui Ridge, *Grant 7025* (BISH); east branch of east Makaleha Valley, *Bishop, Porter, & James 1214* (HAW, US), *Degener, Greenwell & Hatheway 20686* (NY, HOLOTYPE OF *P. waianensis*, BISH, ISOTYPE); Makaleha Valley, in small side gulch, *Hatheway 389* (BISH); Makaleha Valley, *Rock 17323* (BISH); ridge between east and west branches of east Makaleha Valley, *Hatheway, Kekudome, & Miller 355* (US); Makaleha Ridge, *Meebold*, in June, 1932 (BISH); north slope of Mt. Kaala, *Degener, Murashige, & Kerr 20079* (BISH, MO, NY, P, US), *Degener, Topping, Martinez, & Salucop 11586* (NY); east side of Kaaawa Gulch on north slope of Puu Kaala, *Degener &*

FIGURES 67 – 80. Variation in flower and fruit morphology in *Psychotria hathewayi*: 67 – 72, var. *hathewayi*: 67, staminate flower, from *Russ*, 1 June, 1933 (BISH); 68, pistillate and 4-merous flower, from *Russ*, in May, 1930 (BISH); 69, from *Grant 7025* (BISH), cross section (a) and entire fruit (b); 70, mature fruit, from *Christophersen, Wilder, & Hume 1578* (BISH); 71, mature fruit, from *Stone 3794* (BISH); 72, mature fruit, from *Stone 3445* (BISH); 73, var. *brevipetiolata*: mature fruit, from *Degener & Salucop 11525* (MO); 74, & 75, var. *hathewayi*: pistillate flower, from *Pearsall 507* (BISH); 75, pistillate flower, from *Russ*, in Oct. 1929 (BISH); 76, var. *brevipetiolata*, staminate (?) flower, from *Swezey s.n.* (BISH); 77 & 78, var. *hathewayi*: 77, pistillate flower, from *Nagata 864* (BISH); 78, from *Russ*, in June, 1929 (BISH), staminate flower (a), with detail of a stamen (b) 2.2 mm. in length; 79, var. *brevipetiolata*, from *Hume 565* (BISH), staminate, 4-merous flower (a), with detail of pistil (b) and a trichome (c), actual size of trichome, from calyx, 350 μ; 80, var. *hathewayi*, from *Degener, Silva, & Hatheway 20736* (US), mature fruit (a) and cross section (b).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Salucop 11584 (NY); north slope of Mt. Kaala, Du Ponte Trail, *Hatheway & Degener 205* (BISH, US), *Stone 3186* (BISH, RSA, US); southeastern slope of Puu Kaala, *Hatheway, Morton, & Cutress 220* (US); Mokuleia – Makua Divide, *St. John 12236* (BISH); Makua, *Russ*, in May 1930 (BISH); southeastern slope of Makua Valley opposite Piko Trail, *Degener, Silva, & Hatheway 20736* (NY, US), *St. John 17662* (BISH); Puu Hapapa, summit ridge, *Degener & Hatheway 21002* (BISH, NY, US); Kaluaa Gulch, *Hutchison, Daniels, & Obata 7379* (BISH); Puu Kanehoa, side of east ridge, *St. John 14049* (BISH), *Stone 3445* (BISH); Kunia Trail east of Puu Kanehoa, *Thorne 33325* (RSA), *Stone 3294* (BISH); Kaluaa Gulch, *Sohmer 6002* (UWL), *10829* (UWL), *10830* (UWL), *10834* (UWL), *10848* (UWL), Puu Kaua – Kanehoa, on side ridge above Kunia Camp, *Pearsall 491* (BISH), *Pearsall 507* (BISH); Kanehoa, below main ridge, *Hume 129* (BISH); north fork of valley east of Palikea, *St. John 10360* (BISH); Kaaikukae, *Russ*, in Oct. 1929 (BISH), in June, 1929 (BISH); Kaeleku, west branch near trail, *Russ*, 1 June, 1933 (BISH); Palehua, *Degener & Park 11585* (NY); Puu Kapu, *Christophersen, Wilder, & Hume 1578* (BISH); trail between Mauna Kapu and Palikea Peak, *Chambers 2992* (NY), *Degener, Park, & Shigeura 11496* (NY), *Hutchison & Obata 2811* (US), *Nagata 864* (BISH); Kupihau, *Russ*, 12 May, 1933 (BISH).

8b. **Psychotria hathewayi** var. **brevipetiolata** Fosberg in Brittonia **16:** 267. 1964. FIGURES 9, 73, 76, 79, 81.

Straussia sessilis Degener & Hosaka in Bull. Torrey Bot. Club **67:** 301. 1940; non *Psychotria sessilis* Vell. nec auct.

Leaves sessile or with petioles to 8 mm. long (mostly less than 5 mm. long) and oblong-oblanceolate, oblong-elliptic to rotund blades 1.5 × 1.8 – 7.3 × 12.6 cm. wide and long, these obtuse, rounded, or cordate at base, rounded at apex, glabrous or puberulent beneath, and usually without or with very small, domatia in the axils of the 6 – 10 lateral veins per side; inflorescence sessile or with a peduncle to 20 mm. long; flowers with calyces usually hirsute or puberulent, but the corollas infrequently so.

TYPIFICATION: The taxon described by Fosberg as *Psychotria hathewayi* var. *brevipetiolata* is part of a more inclusive taxon which was first described by Degener & Hosaka as *Straussia sessilis,* the epithet of which is not available in *Psychotria*. At the varietal rank, Fosberg's name has priority. The type collection for this taxon is *Degener, Greenwell, Hatheway, & Caindec 20839* (NY, HOLOTYPE) (FIGURE 81). It was collected between Puu Manawahua and Mauna Kapu, Oahu. The type collection of *Straussia sessilis* is *Degener & Salucop 11525* (NY, LECTOTYPE; BISH, GH, MO, W, ISOLECTOTYPES). As it was not possible to determine exactly which of the sheets of this collection was intended by the authors as holotype, I have designated the sheet at NY as lectotype, assuming that that is where such a sheet would have been deposited by Degener, although Degener himself indicates that at that time the holotype was on loan to BISH. The illustration for his taxon, however, does not match the sheet deposited therein at present, although handwritten notes on the labels of the specimens at MO and W state "drawn from *Fl. Haw.*"

There appears to be a tendency in this variety to limit the elongation of the petioles, peduncles, and pedicels, leading to sessile leaves and "sessile" inflorescences.

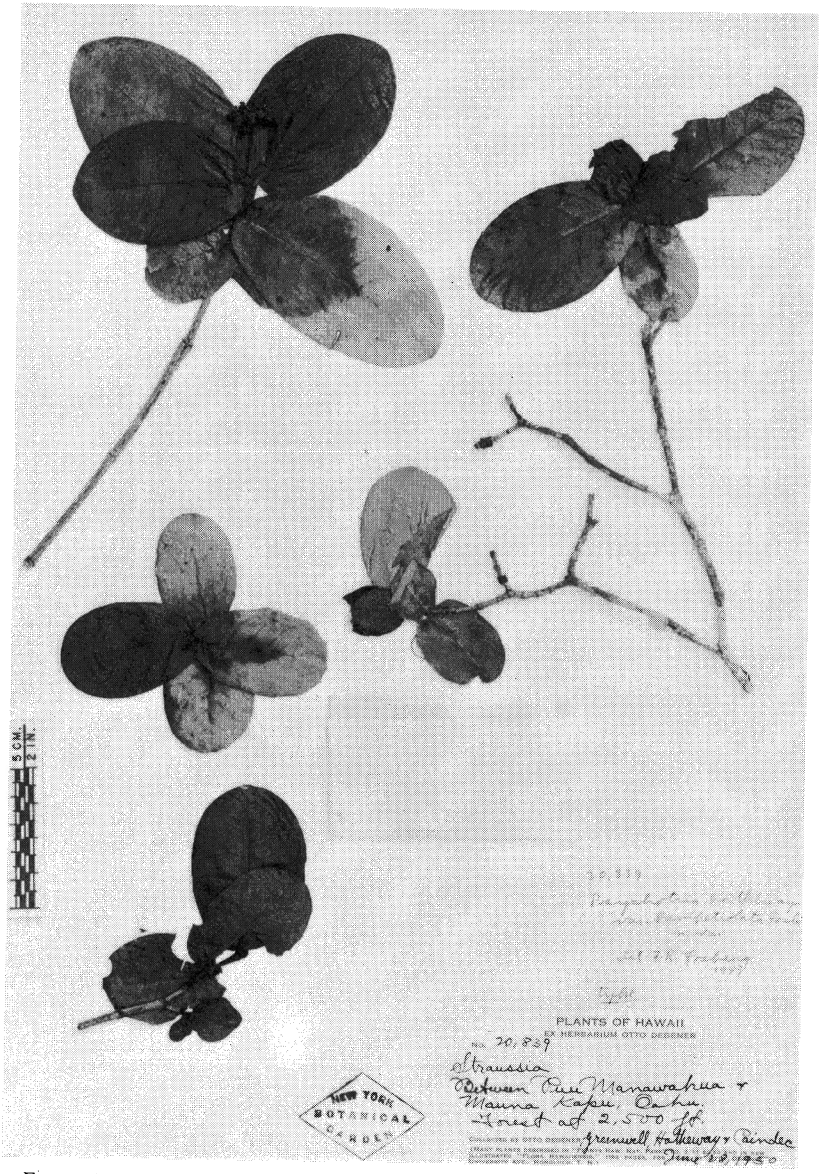

FIGURE 81. *Psychotria hathewayi* var. *brevipetiolata* Fosberg, from *Degener et al. 20839* (NY, HOLOTYPE).

DISTRIBUTION: Waianae Mts. of Oahu in relatively dry forests. This variety is more often the one found on the ridge tops, and the shorter petioles and more compact inflorescences may be adaptations to this environment.

OAHU: Waianae Mts.: Kukuliala Valley, *Swezey,* 15 Sept. 1933 (BISH), *s.n.* (BISH); ridge east of central Makaleha Valley, *Ozaki 1519* (BISH), Makaleha Valley, *Rock s.n.* (BISH); *Degener & Salucop 11525* (NY, LECTOTYPE, BISH, GH, MO, W, ISOLECTOTYPES of *Straussia sessilis*); southeastern base of Puu Kaala, *Degener, Salucop & Arlantica 11816* (NY, WIS); Schofield trail to Puu Kaala, *Hume 565* (BISH); Makaha Valley, *Forbes*, 12 – 19 Feb. 1909 (BISH), *Russ*, in Nov. 1931 (BISH), *St. John 11607* (BISH); Kunia Trail, just east of Puu Kanehoa, *Stone 3246* (BISH); Puu Kanehoa, east ridge, *St. John 14048* (BISH); ridge trail to Palikea, *Cowan 671* (NY), *Crosby & Anderson 1920* (BISH); near Palikea, *Degener, Park, Potter, & Topping 11495* (NY); between Mauna Kapu and Palikea, *Degener & Silva 21029* (NY), *21030* (NY); near summit of Palikea Trail in vicinity of old C.C.C. Camp, *Sohmer 6446* (UWL); ½ mi. from Mauna Kapu on ridge to Palikea, *Hutchison & Obata 2811* (BISH, F, NY, US); Palehua, *Skottsberg 345* (BISH); Puu Kapu, *Christophersen, Wilder, & Hume 1559* (BISH); between Puu Manawahua and Mauna Kapu, *Degener, Greenwell, Hatheway, & Caindec 20839* (NY, HOLOTYPE).

9. **Psychotria fauriei** (Léveillé) Fosberg in Occas. Pap. Bishop Mus. **23:** 43. 1962, in Brittonia **16:** 268. 1964. FIGURES 9, 82 – 87.

Straussia fauriei Léveillé in Repert. Sp. Nov. **10:** 155. 1911; Rock, Indig. Trees Haw. Isl. 449. 1913; Skottsberg in Acta Horti Gothob. **10:** 181. 1936.

Mostly small shrubby trees 3 – 9 m., with chestnut or light brown twigs and broadly ovate to obovate stipules to 10 mm. long, these glabrous within and tardily caducous; leaves usually sessile, infrequently with petioles to 3 mm. long and obovate, obovate-oblong, to nearly oval blades 1.8 × 2.5 – 5.5 × 10 cm. wide and long, these strongly coriaceous and usually with the vein reticulations very conspicuous, drying a conspicuous orange-brown, the base obtuse, rounded or subcordate, the apex obtuse, rounded or nearly truncate, the blades glabrous or puberulent beneath, with domatia absent or very small and inconspicuous in the axils of the 6 – 12 lateral veins per side; inflorescence nearly sessile or with the peduncle to 5 cm. long, with 1 or 2 nodes with verticillate branching at each, the peduncle and branches terete or quadrangular, glabrous or more usually with a reddish pubescence, the branches often again divaricately branched, the ultimate ones usually terminating in single cymules of 3 sessile flowers each or in double cymules, subtended by small bracts; flowers 4- or 5-merous, functionally staminate or

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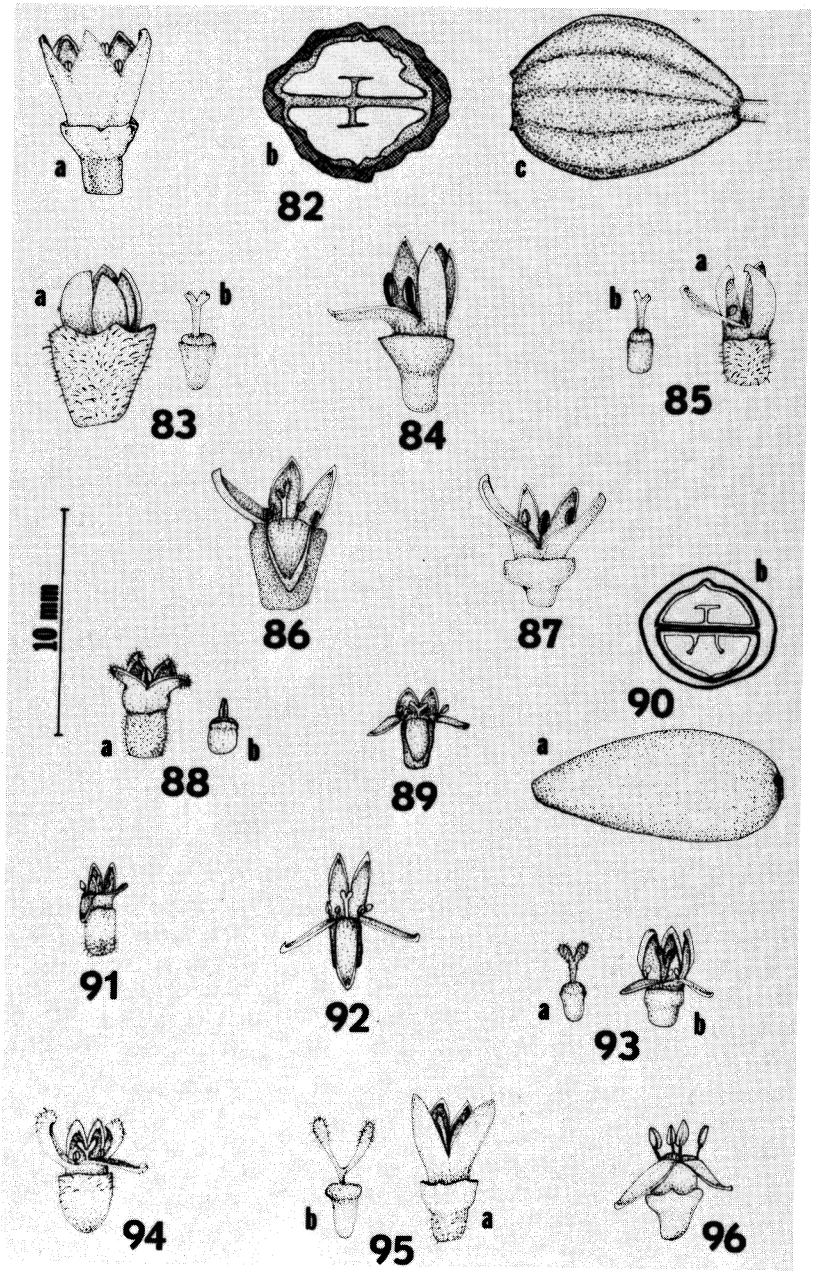
FIGURES 82 – 96. Variation in flower and fruit morphology of Hawaiian *Psychotria*; 82 – 87, *P. fauriei*: 82, from *Grant 7234* (BISH), pistillate flower (a), with cross section of fruit (b) and entire fruit (c); 83, from *Degener et al. 19643* (BISH), immature flower (a) and pistil (b); 84, staminate flower, from *Rock 329* (BISH); 85, from *Russ s.n.* (BISH), pistillate flower (a) with pistil (b); 86, pistillate flower, from *Crosby & Anderson 1536* (BISH); 87, staminate flower, from *Stone 1184A* (BISH); 88 – 96. *P. mauiensis*: 88, from *Forbes 2094.M* (BISH), staminate flower (a) with pistil (b); 89, pistillate flower with staminodes, from *Rock 8025* (BISH); 90, from *St. John & Hosaka 18883* (BISH), mature fruit (a) with cross section (b); 91, pistillate flower, from *Rock 7072* (BISH); 92, pistillate flower, from *Forbes 2366.M* (BISH); 93. from *Forbes 2049.M* (BISH), pistillate flower with detail of pistil (a) and entire flower(b); 94, pistillate flower, from *Degener & Degener 28658* (BISH); 95, from *Kondo & Arnemann s.n.* (BISH), pistillate flower (a) with pistil (b); 96, staminate flower, from *St. John 18743* (BISH).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pistillate; calyx 2 – 4.5 mm. long (including hypanthium), somewhat or strongly dilated toward the summit, nearly truncate or with shallow, glabrous or pubescent, obtuse lobes; corolla with tube 2 – 4 mm. long, slightly expanded toward the summit, glabrous at the throat, with broadly ovate to obovate, thick lobes 2 – 4 mm. long and entirely glabrous, reflexed at anthesis; stamens (of the functionally staminate flowers) with filaments to 1 mm. long, affixed to the base of the oblong-elliptic 0.9 – 1.2 mm. long anthers; pistil with ovary 1.7 – 3.2 mm. long (including terminal disc), the style 1.2 – 2 mm. long at anthesis with stigmas divaricate to 0.8 mm. long, glabrous or puberulent; fruit 9 – 11 mm. long, pyriform-globose, often with a very short disc protruding from within the remnant calyx; pyrenes more or less semicircular in cross section, with 1 or 2 invaginations of the seed coat on the ventral surface often forming a "T"-shaped pattern.

TYPIFICATION: Léveillé described his new species of *Straussia* from a collection made by Faurie *(400)* on the Nuuanu Pali in 1909. This specimen has not been located. Judging from his description, Léveillé's type specimen was an individual which had leaves at the smaller end of the spectrum of the total variation presented by the species.

DISTRIBUTION: This species is one of the most distinct Hawaiian *Psychotriae* from an ecological standpoint, being found on or near the summits of the wind-swept ridges of the Koolau Range of Oahu (FIGURE 9). Flowering specimens have been gathered from June through March.

OAHU: Koolau Mts.: Kawailoa, very wet forest on summit ridge, *Bryan 873* (NY), *Bryan & Swezey 874* (BISH); between Punaluu and Kaipapau, *Forbes*, 14 – 21 Nov. 1908 (F, MO); Punaluu Mts., *Rock 25* (BISH), *327* (A, BISH), *329* (BISH), *331* (BISH), *634* (GH); trail to summit ridge from Moanalua Valley, *Carlquist 2416* (RSA), *Herbst & Bishop 1554* (HAW); Castle Trail, *Stone 1161* (BISH); Kipapa – Waiahole crest, *Grant 7234* (BISH); Waikane – Schofield Trail, *Baxter*, 7 May, 1939 (MO); Kipapa Gulch, south ridge, *Hosaka 635* (BISH), *1103* (BISH), *Yamaguchi 1261* (BISH); Kipapa Gulch, *Hosaka 753* (BISH); Koolau ridge between Kahana and Wahiawa Valleys, *Harris C242228* (BISH); Puu keehiakahoe, "cloud-swept summit..." *Degener, Greenwell, Murashige, & Kerr 19643* (BISH, MIN, NY, US, W); Lanihuli Trail, *Forbes*, 17 Sept. 1908 (BISH), *Russ*, 19 July, 1933 (BISH), *Swezey* in June, 1919 (BISH); above and west of Wiliwilinui Ridge, *Crosby & Anderson 1536* (BISH, GH); Wiliwilinui Ridge, near summit, *Degener, Greenwell, & Murashige 19706* (BISH, NY, US, W); Waialae – Iki Trail, *Stone 1184A* (BISH); Waialae Iki – Wailupe Ridge, *Lamoureux 514* (HAW); "mauka of Honolulu," *Degener 20916* (US).

This species is an excellent example of adaptation. The shrubby nature of most of the individuals, and the leaf blades, which are usually very stiffly coriaceous, with short petioles or none, are probably good characters to have in the niche it occupies near or at the summits of wind-swept ridges. The stiffly coriaceous leaf blades, which often show the venation as thick ridges, giving a rugose appearance to the whole blade, are diagnostic features for the species. Another character previously unnoted can be used in the herbarium to help identify members of this taxon. The leaves usually dry a dark orange-brown color which is not present in any other taxon of Hawaiian *Psychotriae* as a regular feature. Contrary to Skottsberg's (1944b) opinion, I think that *P. fauriei* is very well differentiated from the other closely related

species in the genus, despite the apparent introgression that occurs, particularly with *P. kaduana*. The species is ecologically very distinct.

10. **Psychotria mauiensis** Fosberg in Brittonia **16:** 266. 1964.

FIGURES 38, 39, 88 – 99.

Straussia oncocarpa Hillebr. Fl. Haw. Isl. 180. 1880; Rock, Indig. Trees Haw. Isl. 448. 1913; non K. Schum. 1898.
Straussia oncocarpa var. *subcordata* Rock, Indig. Trees Haw. Isl. 448. 1913.
Straussia hillebrandii var. *molokaienis* Rock, Indig. Trees Haw. Isl. 455. 1913.
Straussia hillebrandii var. *rotundiflora* Skottsberg in Acta Horti Gothob. **15:** 472. 1944.
Psychotria hawaiiensis var. *molokaiensis* Fosberg in Brittonia **16:** 271. 1964.
Psychotria hawaiiensis var. *rotundifolia* Fosberg in Brittonia **16:** 271. 1964.

Plants extremely variable in habit, shrubby and to 4 m., or trees up to 12 m. tall, with young twigs grayish brown, chestnut-brown, or yellowish brown, with deltoid-ovate to broadly obovate stipules to 1.5 cm. but often under 0.6 cm. in length; leaves sometimes sessile, but usually with petioles

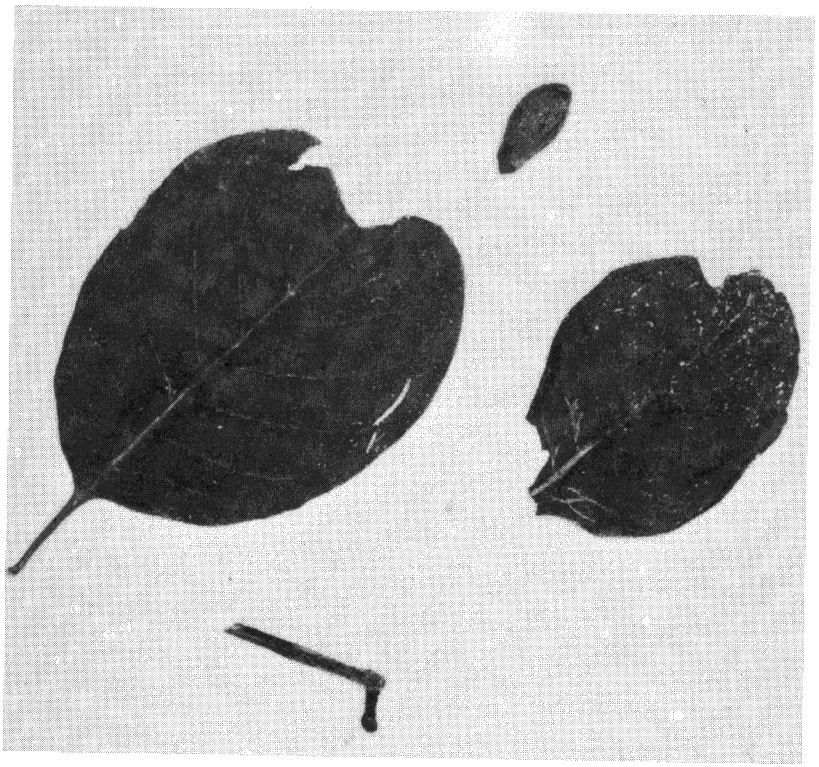


FIGURE 97. *Psychotria mauiensis* Fosberg, from *Hillebrand s.n.* (BISH, LECTOTYPE); the fruit in the figure is a little over 1 cm. long.

0.5 – 2 cm. long, the blades broadly obovate to oblanceolate, elliptic, or nearly rotund, membranaceous to coriaceous, 1 × 1.8 – 9.3 × 13 cm. wide and long, acute, rounded, or nearly truncate at base, obtuse or rounded at apex, glabrous or pubescent, plane or infrequently revolute, with domatia absent or inconspicuous in the axils of the 4 – 10 lateral veins per side; inflorescence with one main axis, the peduncle 1 – 7.4 cm. long, with 1 or 2 nodes with verticillate branching at each, the branches often again branched, either divaricately or verticillately, the peduncle and branches glabrous or pubescent, the ultimate branches usually terminated by cymules of 3 flowers with the lateral flowers of each cymule often on small pedicels, the branches subtended by small bracts; flowers 4- or 5-merous, functionally pistillate or staminate; calyx 2 – 2.8 mm. long (including hypanthium), usually glabrous but sometimes pubescent or hirtellous, truncate or with short, obtuse lobes; corolla with tube 1 – 2 mm. long, somewhat expanded toward the apex, glabrous at the throat, the lobes broadly ovate to lanceolate, frequently thick, 1.2 – 2.9 mm. long, usually glabrous but infrequently pubescent on the dorsal surface and the apex; stamens (of the staminate flowers) with filaments to 1 mm. at anthesis, affixed to the base of the ovate-oblong 0.7 – 0.9 mm. long anthers; pistil (of the pistillate flowers) with ovary 1.5 – 2.5 mm. long at anthesis (including terminal disc), the style 0.5 – 2.5 mm. long, glabrous or pubescent, the stigmas divaricate, 0.6 – 2 mm. long, glabrous or pubescent; fruit oblong-pyriform, 9 – 15 mm. long, with or without the terminal disc protruding somewhat from within the small persistent calyx; pyrenes semicircular in cross section, with "T"-shaped invaginations of the seed coat on the ventral surface.

TYPIFICATION: Hillebrand described this taxon from material he collected in Ulupalakua in East Maui. This material was destroyed in Berlin during the war, but some duplicate fragments of the type collection were obtained by the Bishop Museum before the war. I have designated these as the lectotype (FIGURE 97). The material demonstrates the basically elliptic leaf blades, a mature fruit, and part of the inflorescence. Although Hillebrand's epithet was available for use in *Straussia*, it had been utilized for another species of *Psychotria*. Fosberg, therefore, supplied the new name *P. mauiensis*.

Rock's var. *subcordata* was based on his collection *7072* (BISH, HOLOTYPE; GH, ISOTYPE). This collection was representative of a population whose individuals had leaves which became truncate or subcordate at the base. The type specimen shows this characteristic clearly. In *Psychotria mauiensis*, however, as in *P. kaduana*, we have a taxon which has a large number of variant forms, but for each of which there are intergrading and connecting forms. Again, there is no way in which one can with logic and reason recognize these variations formally. The taxonomic approach must recognize a large, polymorphic taxon with inherent variation.

Rock at the same time also described a var. *molokaiensis* in *Straussia hillebrandii*. After examining the type collection *(Rock 7085)* I believe this taxon is simply another variation of *Psychotria mauiensis*. Fosberg also

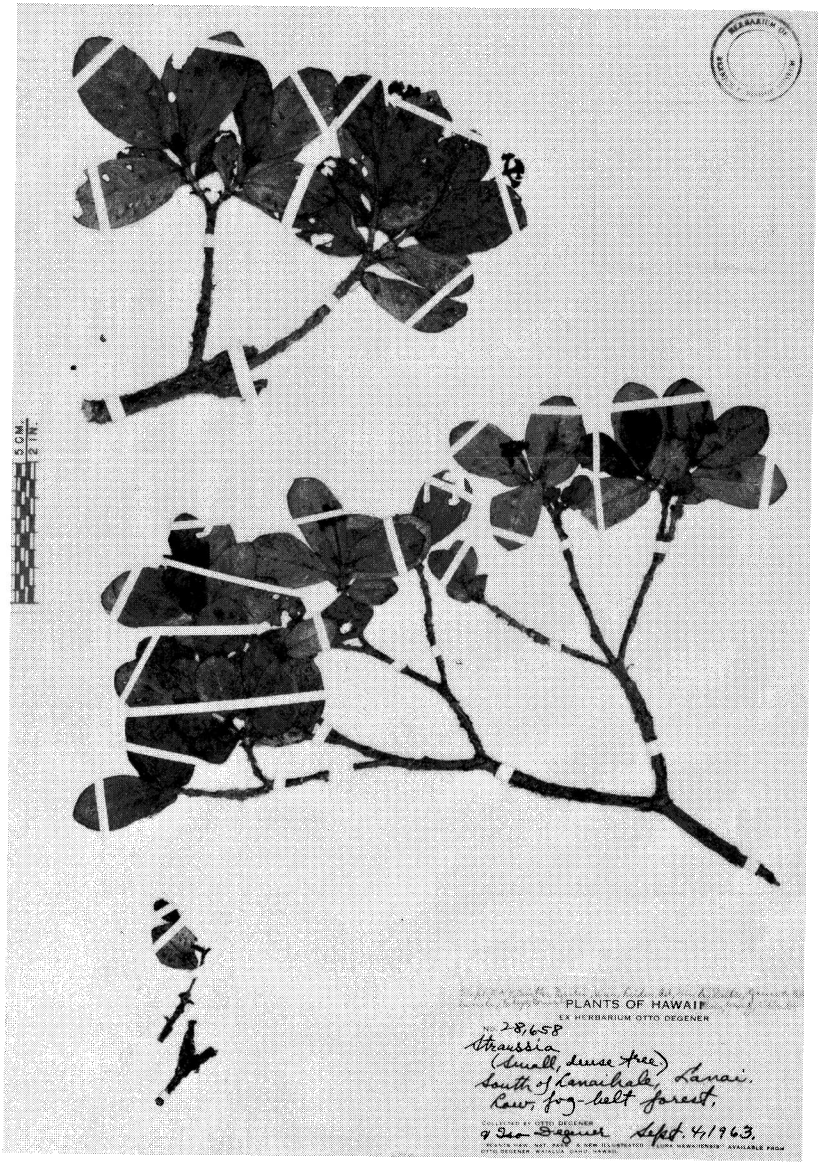


FIGURE 98. *Psychotria mauiensis*, from *Degener & Degener 28658* (BISH); small-leaved variation found on ridge tops of Lanai.

apparently had his doubts about this variety, for in his treatment wherein he made the new combination *P. hawaiiensis* var. *molokaiensis*, he stated, referring to the variety: "Its status is uncertain." The holotype should be at BISH, but I have not seen it. I have seen the isotype at GH.

In 1944 Skottsberg described a var. *rotundifolia* for *Straussia hillebrandii*, which was transferred by Fosberg to *Psychotria hawaiiensis*. Skottsberg apparently named this variety to account for the type collection *(Skottsberg 3150)* which was obtained on the Upper Hamakua Ditch Trail, head of Alakahi Valley, in the Kohala Mts. of the island of Hawaii. I have not seen this collection, but the description clearly describes, to my mind, a member of the taxon *P. mauiensis*. There is no sharp line of demarcation between *P. mauiensis* and *P. hawaiiensis*, except for the matter of the size of the fruit. Skottsberg's specimen was staminate, however, as he well recognized, and his illustrations *493* and *494* in his paper (1944a) show a flower of this specimen. Skottsberg says: "If collected in Oahu this might have passed as a form of *S. kaduana*,..." which makes me suspect that he placed his variety in *S. hillebrandii* only because he collected it on Hawaii. I have also seen other specimens which I refer to *P. mauiensis* which were obtained from the Kohala Mts., the oldest part of the island of Hawaii as it exists at this time. I therefore have little doubt in reducing Skottsberg's variety to *P. mauiensis*.

DISTRIBUTION: Found commonly in middle to higher elevation forests, or along the crests of ridges of Molokai, Lanai, Maui, and Hawaii (FIGURES 38, 39, and 99). Flowering specimens have been collected almost throughout the year.

MOLOKAI: Hanalilolilo, head of Waikolu Valley, *St. John et al. 12395* (BISH); mts. above Puu Kolekole, *Forbes 216.Mo* (BISH); Kamolo, *Faurie 402* (A); Wailau Pali, *Rock 7072* (BISH, HOLOTYPE of *Straussia oncocarpa* var. *subcordata;* GH, ISOTYPE); Kaluaaha, *Rock 7054* (BISH), *7085 (*GH, ISOTYPE of *Straussia hillebrandii* var. *molokaiensis*); Pukoo, *Faurie 401(*A); Molokai without specific location, *Munro,* 5 June, 1916 (BISH).

LANAI: Hulopoe Gulch at Munro Trail, *Degener & Degener 33629* (WIS); Hulopoe Gulch, Mahana, *St. John & Eames 18743* (BISH); near Koele, *Forbes 42.L* (BISH, MIN); north of Lanai City, *Degener 22199* (NY); Kaiholena Ridge, *Degener & Degener,* 10 Aug. 1957 (BISH); Kaiholena Valley, *Forbes 5.L* (BISH, RSA, US); Waiakiola, *Rock 8024* (A, BISH, GH), *8025* (BISH, GH); Lanihale, Pawili, *St. John & Eames 18781* (BISH); Lanihale, *Kondo & Arnemann*, 26 Mar. 1971 (BISH); Puu Kole, *Degener & Degener 30734* (A, NY); south of Lanihale, *Degener & Degener 28658* (A, BISH, NY, W); gulch southeast of Haalelepaakai, *Degener & Degener 30735* (NY); Kaohai, head of Awehi Gulch, *St. John & Hosaka 18883* (BISH); Lanai, without specific location, *Forbes 214.L* (BISH, RSA, US), *325.L* (BISH), *346.L* (BISH), *378.L* (BISH), *379.L* (BISH, W), *Hitchcock 14657* (US), *Munro 13* (BISH), *17* (BISH), *Rock 8047* (A, BISH, GH).

MAUI: West Maui: Honokohau Valley, *Bishop, Theobald, & Stoeker 1161* (HAW); Puu Kukui, *Herbst & Bishop 1352* (HAW); *Hitchcock 14760* (US), *Wilbur & Webster 929* (BISH); Olowalu Valley, *Forbes 2308.M* (BISH); Ukumehame Gulch, *St. John 25679* (BISH); north of McGregor, *Degener, Barber, Tam, & Tousley 22051* (BISH, NY, US); West Maui without specific location, *Rock 8167* (A, BISH, GH); East Maui: Haleakala, *Faurie 399* (A), *Forbes 2094.M* (BISH), *2536.M* (NY, RSA, US), *Rock 8541* (A, BISH, GH); Makawão, *Rock 8540* (BISH, GH), *8542* (A, BISH, GH); Camp Ululele, *Forbes 927.M* (BISH): Waikamoi, road to Olinda Flume, *Crosby & Anderson 1828* (GH); lower Nahika Road, north of Hana—Kahului Road, *Chock 338* (BISH); Olinda, Pipeline Trail, *Degener 17815* (BISH), *17817* (BISH); Auwahi, south slope of Haleakala,

Forbes 1977.M (BISH), *2049.M* (BISH), *Herbst, Lamoureux, & Bishop 733* (HAW); Ulupalakua, *Bryan*, in Oct. 1952 (BISH), *Hillebrand 12857* (BISH), *s.n.* (BISH, LECTOTYPE); Maui without specific location, *Forbes 2366.M* (BISH, MIN), *Hillebrand & Lydgate s.n.* (BISH).

HAWAII: Kohala Mts., Holokaoea Gulch, *Rock 4215* (BISH); Kohala Mts., *Rock 8327* (GH), *8370* (GH), *8397* (BISH); Waimea, *Hitchcock 14347* (US), *14397* (US); Kohala Mts., Puu Ahia, Kawaihae, *St. John & Hosaka 11484* (BISH).

HAWAIIAN ISLANDS without further data, *Rock s.n.* (BISH).

This species is extremely variable and heteromorphic in all features: leaf shape and size, indument, size of floral parts, etc. Familiarity with the section *Straussia* leads me to the hypothesis that this taxon had as its basis elements of *Psychotria hathewayi* and *P. kaduana* which had dispersed to the islands of Maui, Molokai, and Lanai, introgressed, and which have been adapting to the habitats present there. The variation and intergradations defy

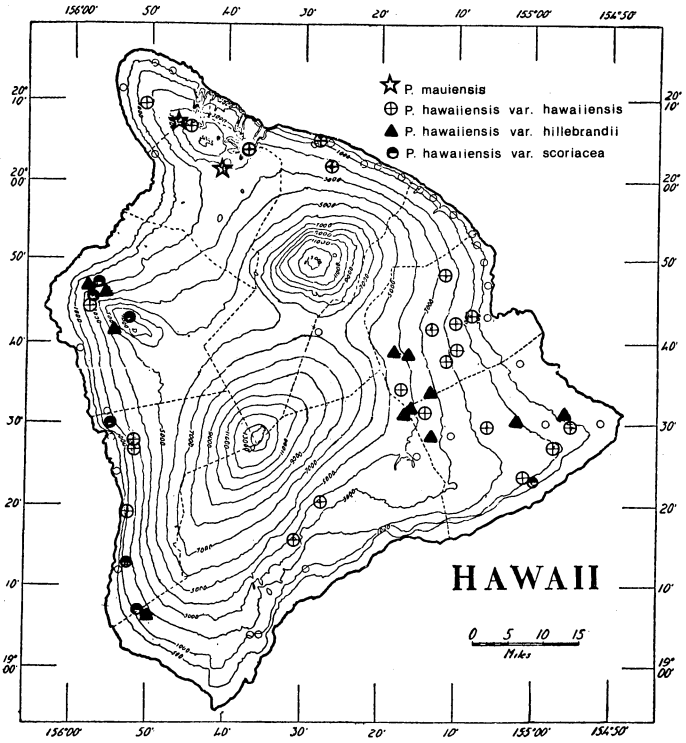


FIGURE 99. Distribution of *Psychotria* taxa on the island of Hawaii.

any logical scheme designed to give nomenclatural status to some of its more diverse elements. A pronounced variation occurs on the island of Lanai on wind-swept crests of ridges, represented by collections such as *Degener & Degener 28658, 30734, Forbes 42.L, 325.L, 379.L, Kondo & Arnemann s.n., Rock 8047, St. John 18743, St. John & Eames 18781,* and *Stone 471.* FIGURE 98 shows a good example of this variant, which is evidently an adaptation of elements of *P. mauiensis* to the environment presented by such habitats. I have not recognized this variation formally due to the presence of continuous intergradations between it and *P. mauiensis* proper.

11. **Psychotria hawaiiensis** (A. Gray) Fosberg in Occas. Pap. Bishop Mus. **23:** 43. 1962, in Brittonia **16:** 270. 1964.

Straussia hawaiiensis A. Gray in Proc. Amer. Acad. Arts **4:** 43. 1858; Hillebr. Fl. Haw. Isl. 180. 1888; Rock, Indig. Trees Haw. Isl. 451. *pl. 186.* 1913; Skottsberg in Acta Horti Gothob. **10:** 182. 1936.

Trees to 12 m. in height with gray-, red-, or yellow-brown twigs and broadly ovate to obovate stipules to 8 mm. long, these usually glabrous without but with a flattened patch of bristle-like hairs in the axil; leaves with petioles 0.5 – 4.7 cm. long and elliptic, obovate to subrotund, chartaceous to coriaceous, glabrous to pubescent blades 2 × 2.5 – 9 × 20.5 cm. wide and long, these acuminate, acute, obtuse, or nearly truncate at base and obtuse to rounded at apex, sometimes with a short broad abrupt point, with or without domatia in the axils of the 5 – 13 lateral veins per side; inflorescence with one main axis with peduncle 1 – 7.5 cm. long and 2 or 3 nodes with verticillate branching, the branches usually branched again, often verticillately, and frequently the secondary branches again branched, the ultimate branches terminated by cymules of 3 flowers with the terminal flower of each cymule sessile and the lateral ones often on short pedicels; inflorescence axes glabrous or more usually covered with a reddish or whitish pubescence, often quite thickly so; flowers usually 4-merous, sometimes 5-merous, functionally staminate or pistillate; calyx 2 – 3 mm. long (including the hypanthium), glabrous or pubescent, somewhat dilated toward the top, and either truncate or with very small obtuse lobes; corolla with tube 1 – 2 mm. long at anthesis, somewhat or not at all dilated toward the apex, glabrous or infrequently pubescent at the throat, and with ovate, usually thick, lobes 1.6 – 3 mm. long at anthesis and reflexed; stamens (of the staminate flowers) with filaments about 1 mm. long affixed to the base of the oblong-ovate 1 mm. long anthers; pistil (of pistillate flowers) with ovary 1.2 – 2 mm. long (including terminal disc), the style 1.5 – 2.2 mm. long and with divaricate glabrous or pubescent stigmas to 1.5 mm. long; fruit ovoid or obpyriform, glabrous or pubescent, 6 – 10 mm. long, including the collar-like persistent calyx at the apex and the persistent disc, this sometimes protruding from within the calyx; pyrenes semicircular in cross section, with "T"-shaped invaginations of the seed coat on the ventral or inner surface.

TYPIFICATION: Gray recognized the small fruit as one of the most important differences between his new species and the other species in the section (his genus *Straussia*) that he knew of at that time. The species is not entirely

FIGURE 100. *Psychotria hawaiiensis* (Gray) Fosberg, from *U.S. Expl. Exped.* (US, HOLOTYPE).

restricted to the island of Hawaii; some populations of it apparently are found on Maui and Molokai, but it doubtless has differentiated on Hawaii. The morphological intergradations between *Psychotria hawaiiensis* and *P. mauiensis* are plain to see when one attempts to come to an understanding of the variation that is presented in large collections of these taxa. Indeed, a few specimens from the Kohala Mts. of Hawaii could not be assigned to either species with any degree of certainty. For convenience they have been referred for the most part to *P. hawaiiensis*, but in these cases it probably does not matter to which nomenclatural taxon those populations are referred as long as one is aware of the bridging position that they probably occupy.

Psychotria hawaiiensis is probably the most recently differentiated taxon in the section *Straussia*. The individuals I have referred to *P. hawaiiensis* from the islands of Molokai and Maui probably represent dispersal of this species to those islands, but the possibility that they represent tendencies within *P. mauiensis* to the morphology exhibited by *P. hawaiiensis* cannot be overruled.

I recognize three varieties in the species. The key which follows can be utilized to differentiate these taxa.

KEY TO VARIETIES OF PSYCHOTRIA HAWAIIENSIS

Pubescence on inflorescence axes, if present, reddish in color; leaf blades various, usually obovate to elliptic.
  Leaf blades usually glabrous beneath (Hawaii, Maui) .....11a. var. *hawaiiensis*
  Leaf blades usually pubescent beneath (Hawaii, Molokai) .....11b. var. *hillebrandii*
Pubescence on inflorescence axes whitish or yellowish brown in color; leaf blades tending to be elliptic, subrotund, or orbicular; mostly in the northwest part of the island of Hawaii 11c. var. *scoriacea*

11a. **Psychotria hawaiiensis** var. **hawaiiensis**; Fosberg in Brittonia **16:** 270. 1964. FIGURES 39, 99, 100, 110 – 115.

Trees to 12 m. tall, the leaves with petioles 0.8 – 4.7 cm. long and chartaceous to coriaceous, mostly obovate blades 2.2 × 4.5 – 9 × 20.5 cm. wide and long, these usually glabrous below and with or without domatia, these, if present, often filled with hairs; inflorescence open, spreading, with peduncle 1 – 7.5 cm. long, glabrous or with a reddish or rusty-colored pubescence; fruit 6 – 10 mm. long including the persistent, collar-like calyx at the apex, rarely with a disc protruding from within.

TYPIFICATION: There is one sheet of this taxon at US from the U.S. Exploring Expedition, which is apparently the holotype (FIGURE 100). There are similar sheets at GH and NY, but they cannot be cited as isotypes, as it is not known whether they are part of the same collection.

DISTRIBUTION: Found mostly on the windward slopes of the island of Hawaii, extending into south Kona on the leeward side (FIGURE 99). Found also in disjunct populations on Maui (FIGURE 39). Flowering and fruiting specimens have been gathered throughout much of the year.

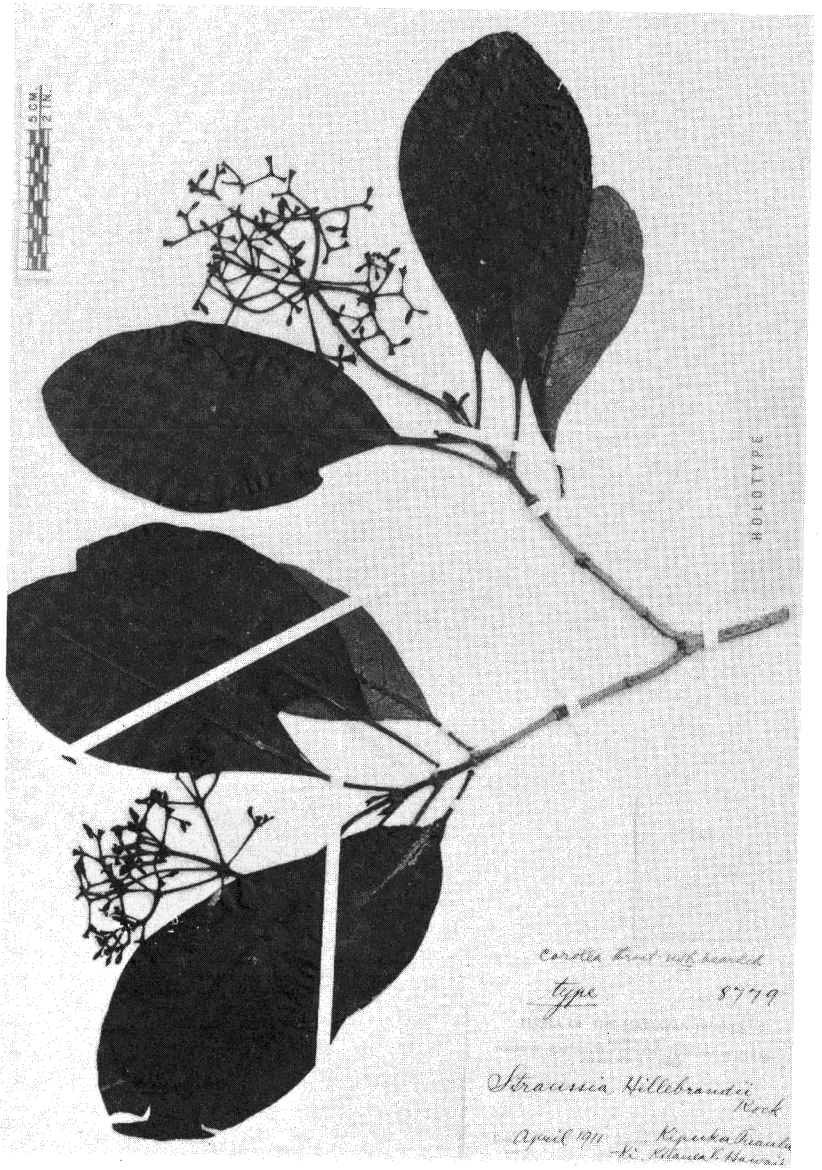


FIGURE 101. *Psychotria hawaiiensis* var. *hillebrandii*, from *Rock 8779* (BISH, HOLOTYPE).

MAUI: Pualaia, *Forbes 1744.M* (BISH); Kailua, north slope of Haleakala, *Forbes 2527.M* (NY); 13 mi. from Hana on north shore drive, *Heed 676A1P* (HAW); Koolau Forest Reserve, Nahiku, Kuhiwa Trail, *St. John & Catto 17899* (BISH); Kipahulu Valley above the plantation, *Forbes 1632.M* (BISH).

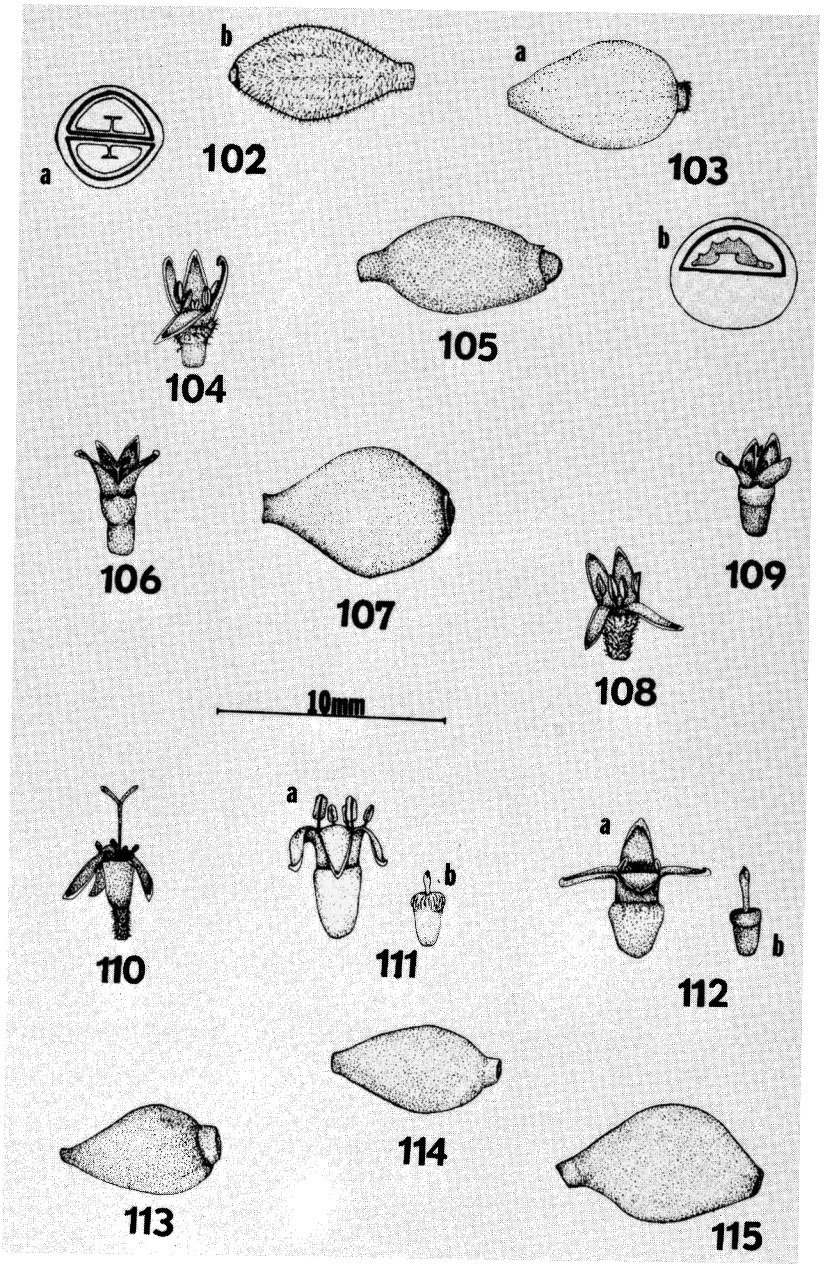
HAWAII: Kohala Mts., Makapala Mauka, *Degener, Degener, & Hoolon 27716* (BISH, NY); Kohala Mts., top of north ridge of Honokane Valley, *Bishop 067037* (HAW); Hamakua, Kalopa, *Degener & Tomish 31555* (A, MO, NY, W); Hilo, *collector unknown*, 3 Apr. 1906 (BISH), *Faurie 386* (A); Saddle Road, 17.5 mi. from Hilo, *St. John, Cowan, & Rogers 22413* (BISH); Saddle Road, Waiakea, *St. John, Cowan, & Rogers*, 26 Dec. 1946 (NY); Saddle Rd., about 20 km. from Hilo, *Herat, Herat, & Higashino 713* (HAW); along RR tracks between Waiakea and Olaa Mill, *Forbes 634.H* (RSA, W), *635.H* (MIN, NY, RSA, US, W); Hilo – Olaa road, *Rock 12860* (A, BISH); Olaa, *Fullaway & Giffard*, in Aug. 1919 (BISH); Kipuka near Pahoa, *Degener & Degener 22719* (A, MIN, NY, W); 2 miles south of Pahoa, *St. John, Bean & Hosaka 11232* (MIN, W); Puna, Kalapana Trail, *Stone 3091* (BISH); Makaopuhi – Kalapana Trail, Upper Kealakomo, *Stone 2954* (BISH), *2999* (BISH); Kulani Prison Road, *Degener & Degener 27718* (NY), *Fosberg 41569a* (US), *41580a* (US), *Herbst 883* (BISH), *Newell 320* (BISH), *944* (BISH), *Sohmer 6198* (GH), *6212* (GH); Kona – Hilo Hwy. 6.8 mi. from Hilo, *Newell 906* (BISH); Volcanoes Nat. Pk., Kipuka Puaulu, *Fosberg 33280* (BISH, US); Naulu Forest, *Eggler 112* (US), *Fagerlund & Mitchell 803* (BISH), *Fosberg 46035* (NY), *48324* (US); Kapalana Road, opposite picnic site at Naulu, *Mueller-Dombois H-217* (HAW); between Pahala and Naalehu, *Skottsberg 234* (BISH); Kau, Ninole, *Degener & Degener 32464* (NY); Kau without further data, *Giffard 365* (BISH); S. Kona, Kapua, *Rock 10028* (BISH, GH); Kukuiopae, *St. John, Cowan, & St. John 22460* (BISH); S. Kona Forest Reserve, 4.5 mi. from Milolii on Hwy. 11, *Sohmer 6291* (UWL); Manuka, *St. John et al. 11334* (BISH); mts. east of Honaunau, *Hitchcock 14584* (US); Hualalai, west slope, Honokahau, *Kondo 333* (BISH); Puu Hualalai, Holualoa Entrance, *Heed G78A4P* (HAW); Kona without further data, *Hillebrand 12859* (BISH), *s.n.* (US); Hawaii without specific location, *Rock 17253* (BISH), *U.S. Expl. Exped.* (US, HOLOTYPE), (GH, NY).

This variety is fairly uniform in morphology. There exist two collections, however, *Rock 17253* and *Kondo 333*, which are unique in representing individuals which have the largest leaves in this taxon. Proper evaluation of this variation must await further collection. FIGURES 110 – 115 illustrate the variation in flower and fruit size and shape in this variety.

11b. **Psychotria hawaiiensis** var. **hillebrandii** (Rock) Fosberg in Occas. Pap. Bishop Mus. **23:** 43. 1962, in Brittonia **16:** 270. 1964.
FIGURES 38, 99, 101, 106 – 109.

Straussia hillebrandii Rock, Indig. Trees Haw. Isl. 453, *pl. 187, 188*; Skottsberg in Acta Horti Gothob. **10:** 182. 1935.

FIGURES 102 – 115. Variation in flower and fruit morphology of *Psychotria hawaiiensis*: 102 – 105, *P. hawaiiensis* var. *scoriacea*: 102, from *Forbes 22.H* (BISH), mature fruit (b) and cross section (a); 103, from *Degener 31669* (A), mature fruit (a) and cross section showing undeveloped or aborted contents (b); 104, staminate flower, from *Degener 20241* (NY); 105, mature fruit, from *Rock*, in Mar. 1920 (A); 106 – 109, *P. hawaiiensis* var. *hillebrandii*: 106, pistillate, 4-merous flower, from *Rock 8779a* (BISH); 107, mature fruit, from *Fosberg 44454* (US); 108, staminate flower, from *Skottsberg 1934* (BISH); 109, pistillate flower, from *Meebold*, in May, 1932 (BISH); 110 – 115, *P. hawaiiensis* var. *hawaiiensis*: 110, pistillate flower, from *Giffard 365* (BISH); 111, from *Fosberg 41569a* (US), staminate flower (a), with detail of functionless pistil (b); 112, from *Degener, Degener, & Hoolon 27716* (NY), staminate, 4-merous flower (a) with detail of functionless pistil (b); 113, mature fruit, from *Forbes 635.M* (BISH); 114, mature fruit, from *Degener & Degener 27718* (NY); 115, mature fruit, from *Forbes 2527.M* (NY).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Trees to 12 m., the leaves with petioles 0.5 – 3 cm. long and chartaceous to coriaceous, obovate to obovate-oblong, rarely suborbicular blades 3 × 5 – 7.5 × 12.6 cm. wide and long, without domatia, or with very small, inconspicuous domatia in the axils of the lateral veins, usually rusty-pubescent beneath; inflorescence open, the peduncle 2 – 7 cm. long and usually with the axes covered with a rusty or reddish pubescence; fruit 6 – 8 cm. long, including persistent calyx and the usually protruding disc.

TYPIFICATION: Rock's documentation of his type collection leaves little to be desired, including two photographic plates which show both the habit of the type individual as well as a close-up of a fruiting branch. The type collection is *Rock 8779* (BISH, HOLOTYPE; GH, RSA, US, ISOTYPES). The holotype is shown in FIGURE 101. It was collected in the Kipuka Puaulu, Mauna Loa, Hawaii. Rock differentiated between his new species and *Straussia hawaiiensis* principally by the reddish pubescence on the lower surfaces of the leaf blades of his taxon and the lack of "glands" (=domatia). The only characteristic that can be utilized is the presence or absence of pubescence on the abaxial leaf surface.

DISTRIBUTION: Found in wet to moderately wet forests of Hawaii, principally in the Hilo and Puna Districts, with some scattered specimens through North and South Kona and Kau (FIGURE 99). Flowering specimens have been gathered principally during the months from June through September.

MOLOKAI: Pali of Wailau, *Rock 7050* (BISH); Molokai without specific location, *Rock*, in Apr. 1910 (BISH).

HAWAII: Kohala Mts., *Rock 8370* (BISH), *8387* (A); Paahau, *Rock 3436* (BISH); Waiakea, South Hilo District, *St. John, Cowan, & Rogers 22331* (BISH); Volcanoes Nat. Park, Mauna Loa Strip Road, *Newell 158* (BISH), *160* (BISH), *1032* (BISH); Kulani Prison Road, *Newell 497* (BISH), *722* (BISH); Kipuka Puaulu, *Eastwood*, 1 – 16 Aug. 1924 (NY), *Fosberg 44454* (US), *Giffard*, 9 Aug. 1927 (BISH), *Lamoureux 2450* (HAW), *2457* (HAW), *2483* (HAW), *Neal*, 3 Aug. 1927 (BISH), *Rock*, in July – Aug. 1911 (BISH), in Aug. 1911 (BISH, US), *8779* (BISH, HOLOTYPE; GH, RSA, US, ISOTYPES), *8779a* (BISH, NY), *8779b* (BISH), *12586* (BISH), *Russ*, in July, 1927 (BISH), in June, 1930 (BISH), *St. John, Bean, & Hosaka 11269* (NY), *Setchell*, 31 July, 1924 (US), *Shear*, 25 Jan. 1928 (US), *Sohmer 6317* (UWL); slope between Kipuka Ki and Kipuka Puaulu, *Webster & Wilbur 1708* (US); Volcano Kilauea, *Forbes, Brigham, & Thompson*, in 1908 (BISH); northwest of Kilauea, *Degener & Degener 27714* (A, NY, W); Manuka, *Russ*, in Sept. 1927 (BISH), *St. John et al. 11325* (BISH), *Skottsberg 1932* (BISH); Papaloa, *Degener 20241* (BISH, US, W); Paddock – Greenwell Ranch, Kealakekua, *Degener & Greenwell 19376* (NY, US); Puuwaawaa, *Webster & Wilbur 1891* (US); Puu Hualalai, *Meebold*, in May, 1932 (BISH); Kapapola, *Forbes 402.H* (BISH); Belt Rd., 7.7 mi. northwest of junction with South Point Rd., *Lamoureux 435* (HAW); Hawaii without specific location, *Forbes 287.H* (BISH, NY), *Morley*, in June 1934 (BISH).

This variety is differentiated from the typical variety principally on the basis of the presence, in quantity, of a reddish or rusty-colored pubescence on the lower surface of the leaf blades. Although the blades of the leaves tend to be more obtuse at base and apex than in the nominate variety, that characteristic cannot be used to distinguish between the taxa. FIGURES 106 – 109 illustrate variation in the morphology of flower and fruit in this variety.

11c. **Psychotria hawaiiensis** var. **scoriacea** (Rock) Fosberg in Brittonia **16:** 270. 1964. FIGURES 99, 102 – 105, 116.

Straussia oncocarpa var. *scoriacea* Rock, Indig. Trees Haw. Isl. 449. 1913.
Straussia glomerata Rock in Bull. Torrey Bot. Club **45:** 138. 1918.
Psychotria hawaiiensis var. *glomerata* Fosberg in Brittonia **16:** 271. 1964.

Trees to 10 m., the leaves with petioles 0.5 – 2.5 cm. long and obovate-oblong to subrotund, coriaceous blades 2 × 2.5 – 7.5 × 11 cm. wide and long, these usually rounded or subtruncate on both ends, glabrous or hirtellous beneath; inflorescence axes usually covered with a whitish or yellow-brown pubescence, sometimes with the branches very short and numerous resulting in a compact, globose, head-like inflorescence; fruit 6 – 7 mm. long.

TYPIFICATION: Rock named his variety *scoriacea* because of the fact that the type individual was growing in a lava field. He pointed out in his description the "dirty yellowish-gray tomentum" which covered the axes of the inflorescence of the type collection *(Rock 10201)*. The collection was made on the southern slopes of Mauna Loa, Kau District, in Manuka. The holotype is at BISH (FIGURE 116), and I have also examined an isotype from GH.

The type collection of *Straussia glomerata* is *Rock 12829* (BISH, HOLOTYPE). It was collected in the Waihou forest of Puuwaawaa, North Kona District. From the specimens I have examined, the differences between Rock's original taxa tend to fade away the more specimens one has at one's disposal. The incidental fact that he named one of his taxa as a species, *Straussia glomerata*, and the other as a variety of *S. oncocarpa* tends, in my opinion, to support the observation that the latter and *Psychotria hawaiiensis* are closely related. One of the most outstanding characteristics of his *S. glomerata* is the compact, globose nature of the inflorescence on the type specimen. Intergradations occur, however, from this to the more usual open kind of inflorescence, as in *Hitchcock 14502*. Future collecting may demonstrate otherwise, but based on the evidence available to me, I suspect that Rock's taxa are but variations upon the same theme, which are held together by the whitish or yellowish brown pubescence, quite different in appearance from the rusty or reddish-colored pubescence present in the other two varieties, particularly var. *hillebrandii*. The leaf blades are more nearly and more consistently rotund or suborbicular in outline than those of the other varieties; this, their general coriaceous texture, and the habitats in which the individuals are found imply a progressive adaptation to dryer forests. FIGURES 102 – 105 demonstrate some of the variation in flower and fruit morphology in this taxon.

DISTRIBUTION: The variety is found almost entirely on the leeward flank of the island of Hawaii, ranging from Puuwaawaa in the north to south Kona and Kau in the south (FIGURE 99). It occurs in dryer forests relative to most

other taxa of the genus in Hawaii. Its range overlaps, in part, with that of var. *hillebrandii*. Flowering specimens have been gathered beginning in December, and mature fruit are produced by March. Flowering and fruiting appear to continue well into August and September.

HAWAII: Kona Dist.: Puuwaawaa, *Forbes 22.H* (MIN, MO, US, W), *Hitchcock 14472* (US), *14502* (US); between Puuwaawaa and Puu Iki, *Hatheway 451* (US); Puu Hualalai, *Rock 12829* (BISH, HOLOTYPE of *Straussia glomerata*), *St. John et al. 11395* (BISH); Captain Cook, east of Papaloa, *Degener 20241* (NY, US); Papa Bay Subdivision, *Degener & Degener 31669* (A, MIN, NY, W, WIS); Kau Dist.: Manuka, *Rock 10201* (BISH, HOLOTYPE, GH, ISOTYPE); Hawaii Volcanoes Park: Naulu Forest, Kealamomo, *Fosberg 46035* (US); Kipuka Puaulu, *Rock*, in Mar. 1920 (A); Hawaii without exact locality, *Degener & Greenwell 21899* (US), *Ozaki, Kosaki, & Lamoureux 1304* (US).

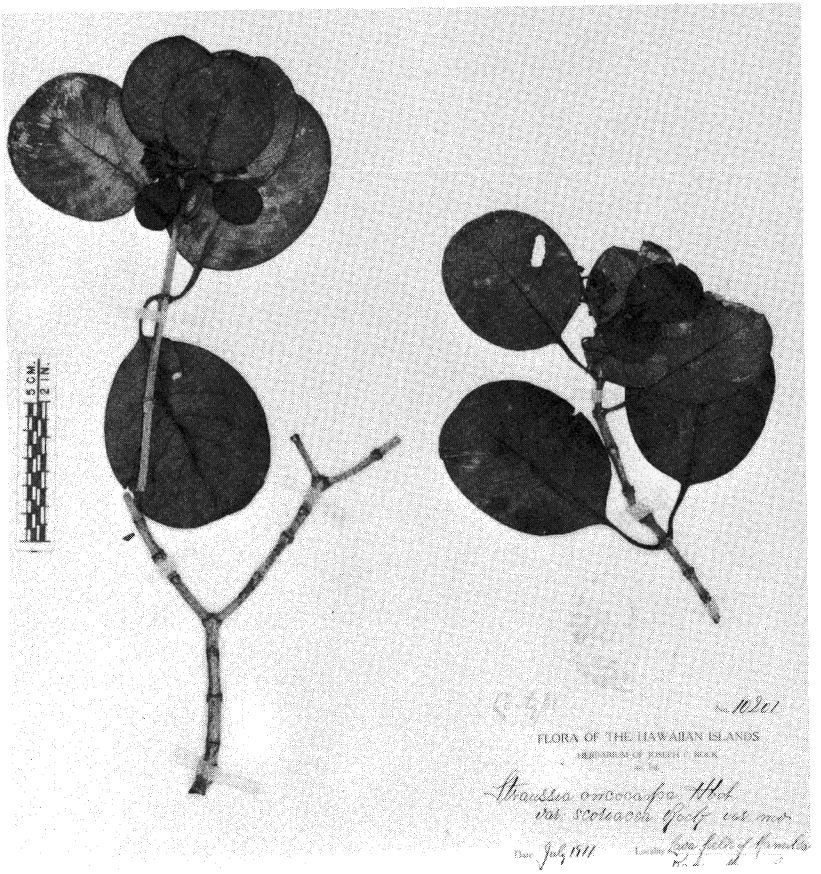

FIGURE 116. *Psychotria hawaiiensis* var. *scoriacea* (Rock) Fosberg, from *Rock 10201* (GH, ISOTYPE).

DUBIOUS TAXON

Psychotria insularum var. **paradisii** Fosberg in Brittonia **16:** 256. 1964.

Fosberg described this taxon from a single collection *(Mann & Brigham 261)*, and its putative existence in the Hawaiian Islands made it the only Hawaiian representative of the section *Psychotria*. No new evidence has come to the surface since Fosberg's work to add to this interesting phenomenon of a variety of an otherwise western Polynesian species being found in the Hawaiian Islands. It is, in my opinion, highly unlikely that members of the same species would be present in both of those areas, unless it is the result of a very recent introduction to the Hawaiian Islands. The holotype is supposed to be at US. Not only is it not there, but the type register at US gives no indication that such a specimen has been deposited there. Therefore I have been unable to examine the holotype. Fosberg also discussed a sterile specimen *(Degener, Greenwell & Hatheway 20796)* in his treatment of this taxon which he believed bore a superficial resemblance to South Pacific members of the genus in the same section as that of his new variety. I have been able to examine this specimen, thanks to Dr. Fosberg, and I have found that it probably represents the result of introgressive hybridization between two taxa found in the Waianae Mountains *(P. hathewayi* and *P. mariniana*, as these taxa are herein recognized). In any case, the stipules on this specimen definitely place it within the section *Straussia* and make of it a strictly Hawaiian affair. I have no evidence, therefore, that would support maintaining *P. insularum* var. *paradisii*.

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